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THE UNIVERSITY OF ALBERTA

A STUDY OF HANDWRITING IN GRADE FOUR, GRADE FIVE,
AND GRADE SIX IN ALBERTA

by

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—

A THESIS

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ABSTRACT

The problem reviewed in the thesis is "A Study of Handwriting in Grade Four, Grade Five, and Grade Six in Alberta." The purpose of the study was to determine the association between rate and quality of handwriting, and the variables type of school, sex, grade, age, type of pen used, handedness, and intelligence; and to note the malformations of letters.

The procedure included collecting and analysing specimens of handwriting of 2,769 pupils in the three grades from selected schools of various size throughout the province of Alberta. The 2,086 samples which contained complete information concerning the variables mentioned were analysed for rate of handwriting and general appearance by a committee of qualified, experienced teachers; one hundred samples for each grade were further analysed, first, for quality of handwriting by a committee of qualified teachers using the criteria established in Bulletin 3, Program of Studies for the Elementary School (Department of Education, 1950), and then for frequency of malformation of letters. Statistical tests were applied to determine the association between rate and quality of handwriting and the variables listed.

The test for association revealed that the type of school, the grade and age of the writer, and the type of pen used tend to affect the rate of handwriting; the sex, handedness, and intelligence of the writer do not appear to affect the rate of handwriting; the grade and sex of the writer appear to affect the quality of writing; while the rate of writing, the type of school, the age, handedness, and

intelligence of the writer, and the type of pen used appear to have no effect on the quality of handwriting in the grades studied.

A study of the data showed that for the grades sampled the rate of writing tended to decrease as the size of the school increased. Grade Six pupils wrote at the fastest rate, followed by Grade Five and Grade Four in that order. There was a tendency for rate to increase with age from age eight through age eleven, to be maintained at age twelve, but to show no further increase in rate in this sample. Pupils who used a ball point pen wrote at the fastest rate, followed by those who used a fountain pen, and then by those who used a straight pen, in the group studied. The ball point pen was the preferred instrument of nearly sixty per cent of the pupils, while only six per cent used a straight pen. There was no apparent difference in the speed at which boys and girls wrote. Left-handed writers in Grades Four, Five, and Six in this study performed equally as well with regard to rate as did the right-handed pupils. There was no apparent relationship between the intelligence of the writer and the rate and quality of his writing. Rate of writing apparently has no effect on quality of writing in the grades studied. The quality of writing appears to be the same regardless of the size of the school. Pupils of every age from eight through fifteen used in this study appear to reach the same level of achievement with regard to quality of handwriting. The quality of handwriting of left-handed pupils is on a par with that of right-handed pupils. Writing done with a ball point pen was equal in quality to that written with either a fountain pen or a straight pen. The quality of the writing of Grade Five pupils exceeded that of either Grade Four or Grade Six pupils. When quality of handwriting

was observed in the sample, boys scored lower than girls. Grade Six pupils in this study wrote almost as many incorrectly formed letters as Grade Four, while Grade Five made the least errors. The letter which caused the greatest number of irregularities was 'h', followed by 'o', 's', 'r', 'd', 'g', and 't'.

ACKNOWLEDGEMENTS

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CHAPTER I

THE PROBLEM

Next to speaking, writing probably fills the most vital need of the school child, for from almost his first week at school he communicates in some measure by means of the written word. As the child moves from grade to grade his success is measured to a large degree by his skill in this basic tool subject, and rich indeed are the rewards of good, legible handwriting.

It is not only in the classroom, however, that good handwriting pays dividends. In social interplay, courtesy demands that handwriting should be legible, and in the business world employers have a right to expect that not one dollar should be lost through an employee's illegible handwriting.

Apart from the scholastic, social, and economic need there is a fourth factor which may be a most useful function of good handwriting to the child. That is the satisfaction which he gains as he perfects the handwriting act and establishes a basis for expression and communication.

Frequent indictment of the standards of achievement in handwriting has been levelled at schools not only by the press, the public, and businessmen, but also by experts whose opinion is likewise sought and highly regarded. One such assessment which is almost merciless in its severity insists that "in most schools handwriting is the worst taught, most neglected, and least understood subject in the curriculum" (Cole, 1941, p. 467).

The Report of the Royal Commission on Education in Alberta

(Province of Alberta, 1959, p. 103), while not reassuring in its assessment of achievement, had this to say about the program:

There has been some suggestion that handwriting and spelling have deteriorated in the public school system. If this is so the inadequacies must be attributed to faulty teaching. Certainly the curriculum guide in handwriting is satisfactory from any point of view, ...

The present program in handwriting, if taught effectively, would enable formal lessons to terminate at the end of the sixth grade.

Factors other than teaching surely must influence or affect achievement or competence in an act requiring skill, so much study and opinion have revolved around questions such as, Do girls write 'better' than boys?; Does intelligence have anything to do with handwriting?; Do left-handed writers achieve at a rate and quality equal to that of right-handers?

The purpose of this study is to test how certain variables, namely, type of school, sex, grade, age, type of pen used, handedness, and intelligence affect the rate and quality of handwriting in grades four, five, and six in Alberta schools.

HYPOTHESES

The following hypotheses concerning rate and quality of handwriting will be tested in this study.

1. Rate

- a. There will be no significant difference between the rate of handwriting and size of the school.

b. There will be no significant relationship between the rate of handwriting and the sex of the writer.

c. There will be a significant difference between the rate of handwriting and the grade.

d. There will be a significant difference between rate of handwriting and age of pupils.

e. There will be no significant relationship between rate of handwriting and the type of pen used.

f. There will be no significant difference between rate of handwriting and handedness.

g. There will be no significant relationship between rate of handwriting and intelligence.

2. Quality

a. There will be a significant relationship between quality of handwriting and rate of writing.

b. There will be no significant difference between quality of handwriting and size of school.

c. There will be no significant relationship between quality of handwriting and the sex of the writer.

d. There will be a significant relationship between quality of handwriting and grade.

e. There will be a significant relationship between quality of handwriting and age.

f. There will be no significant difference between quality of handwriting and the type of pen used.

g. There will be no significant difference between quality of handwriting and handedness.

h. There will be no significant relationship between quality of handwriting and intelligence.

DEFINITION OF TERMS

The terms used and the criteria established in this study are those outlined in Bulletin 3, Program of Studies for the Elementary School (Department of Education, Province of Alberta, 1950, pp. 10-11).

Rate of handwriting refers to the number of letters written per minute.

Quality of handwriting is the total of all the factors, namely, general impression, formation of letters, slant, spacing, size and alignment, and quality of line, which affect the written letter.

General impression refers to the appearance of the handwriting.

Formation of letters refers to the style of the alphabet which was used as a model. That of Bulletin 3 (p. 11) was used as the standard in this study.

Slant refers to the angle which the up or down strokes of the letters make with the line of writing. It should be moderate, forward, and uniform.

Spacing refers to the distance between the letters of each word, and to the distance between the words. It should be uniform and moderate.

Size refers to the largeness or smallness of the letters.

The letters should be uniform in size and not so small that they are hard to read.

Alignment refers to the position of all letters on the base line and to the relative heights of the various letters.

Quality of line refers to the manner in which each stroke of the letter is written. The strokes should be uniform, distinct, and smooth.

Type of pen refers to the instrument used. It includes a) the straight pen, which is a wooden shaft with an insertible steel nib; b) the fountain pen; and c) the ball point pen.

THE EXPERIMENTAL DESIGN

In order to carry out the purpose of the study, a number of specimens of handwriting from each of the grades four, five, and six will be analysed. At least five hundred specimens will be obtained from each of these three grades from schools in Alberta which will be representative of the types of schools according to size and which will be located in areas scattered throughout the province.

Every pupil in the selected classrooms will be asked to write for two minutes from memory, on identical sheets, during the same week, a selection which will then be used to assess both rate and quality of handwriting. Each pupil will be asked to give certain information as to sex, age, grade, type of pen used, and handedness. The teacher will be asked to furnish the intelligence quotient of each student participating in the study.

This information will form the basis of statistical analysis which will be used to find the association between rate and quality of handwriting and the variables, type of school, sex, grade, age, type of pen used, handedness, and intelligence.

To determine the rate of handwriting, the total number of letters written will be divided by two to give the rate in letters per minute. Quality of handwriting will be assessed by assigning to the characteristics of handwriting, certain values according to the criteria established in Bulletin 3 (pp. 10-11).

A committee of qualified teachers will assist the investigator in the assessment, first by assigning to each specimen of handwriting, marks for general impression, and then by assigning marks for each characteristic of handwriting, namely formation of letters, slant, spacing, size and alignment, and quality of line. The total assessment will be the mark for quality of handwriting.

The statistical analysis will be prepared from the raw score data with the assistance of the programming department of the Faculty of Education, University of Alberta, and from this analysis the results will be tabulated and compared.

NEED FOR THE STUDY

It is agreed by handwriting experts and endorsed by Bulletin 3 that constant evaluation of handwriting is necessary so that the school program may facilitate, and be effective in, the improvement of handwriting.

This proposed evaluation of the pupil's handwriting, either by himself or by the teacher, is a continuous process within the classroom and is concerned mainly with the product. It would seem reasonable that an evaluation of handwriting could be conducted on a larger scale, cover an area wider than a classroom or school system, and note the factors which affect handwriting in any way.

Although a great deal has been written, conjectured, and opined by those interested in handwriting in many sections of Canada and the United States, observation is largely confined to the classroom where teachers empirically evaluate the written product.

Research studies are few, and a great deal of the literature on handwriting deals with practices in teaching or with diagnostic and remedial procedures. Furthermore, a large percentage of the studies is not of recent origin, nor did this researcher find any studies relating to Canada or to the Province of Alberta.

A study concerned with the factors which tend to influence the handwriting of the children of this province, therefore, would seem to be of value at this time.

CHAPTER II

REVIEW OF RESEARCH IN HANDWRITING

For the purpose of discovering the trend of investigations into handwriting in the last half century, this chapter will review educational research studies in that field. These studies appear to be concerned chiefly with two main areas of inquiry, firstly, that which deals with the development of handwriting scales, and secondly, that which indicates what factors affect children's handwriting. These two areas of investigation will be discussed under the headings: handwriting scales, and factors which affect children's handwriting.

HANDWRITING SCALES

Research in handwriting is not new. Many studies have reported achievement and procedures affecting teaching methods. Of concern to those faced with the task of evaluating handwriting was the problem of judging the quality. "Measurement of quality always rests on opinion, is largely subjective, and is usually unreliable." (Cole, 1934, p. 145). So, in order to approach some measure of objectivity, researchers developed handwriting scales. An instrument was then available which could measure quality by comparing a child's performance with samples shown on a writing scale and matching it to the sample which it resembled.

The Thorndike Scale for Handwriting of Children

The first handwriting scale constructed, The Thorndike Scale for

Handwriting of Children (published by the Bureau of Publications, Teachers College, 1910), consisted of samples arranged in order of increasing quality from an artificially created sample called 4 to a copybook sample designated 18. Quality 4 represented handwriting worse than any pupil might be expected to produce; quality 18, the copybook specimen, was handwriting better than the best effort of Grade Eight pupils, and the remainder of the specimens were written by children. One thousand specimens were assigned values, on the basis of beauty, legibility, and general merit, by from twenty-three to fifty-five competent judges who rated each specimen to be better or worse than another. If seventy-five per cent of the judges voted one sample to be better than another sample, then that sample was said to be one unit better than the other. In this manner the scale, containing fifteen units, was constructed so that each succeeding sample from 4 to 18 was one unit better than the preceding sample. Under some of the units there were several samples, each of approximately equal merit, of as many different styles of handwriting as could be obtained.

The majority of assessors of handwriting quality admit that everyone does two kinds of writing, one which results from writing as well as one can, and another, representative of our everyday style of handwriting, which is rather more utilitarian than beautiful. Thorndike was realistic enough to give a place on his scale to both types of writing, and therefore his scale has a certain uniqueness. He provided two standards of quality, the first, called usual, representing the writing a pupil did when not stressing quality, for example in other school subjects, and the second

that representing what he would do if told to write his very best. The usual standard was indicated by steps from seven in Grade Two to eleven in Grade Eight, and the best was represented by values from 8.5 for Grade Two to 12.5 for Grade Eight. Also given were norms for speed, in letters per minute, which ranged from 35 for Grade Two to 80 for Grade Eight.

As Thorndike's scale was the first scientifically constructed instrument for evaluating handwriting, one might expect that it would contain some areas of weakness. Its size and shape made it awkward to handle while the variety and style of the samples used in each unit made comparison difficult, as there were as many as four samples of handwriting at some steps and only one at others. However, its most serious deficiency appeared to be that it did not attempt to point out specific defects in the handwriting.

Following this pioneer effort, other scales, devised to improve upon, or to overcome apparent deficiencies in, The Thorndike Scale for Handwriting of Children, were developed.

The Ayres Measuring Scale for Handwriting

The Ayres Measuring Scale for Handwriting (published by Russell Sage Foundation, 1912), prepared for Grades Two through Eight, measured the legibility of writing, which was defined in terms of ease of reading. Ayres designed the scale so that samples of handwriting, numbered in steps from twenty to ninety in order of quality, were printed on a long strip of paper. In this manner one of the weaknesses of Thorndike's scale was overcome. For copy material, the first three sentences of Lincoln's Gettysburg Address were used. All samples were written at a medium slant

and only one sample appeared for each step of the scale. Graphical presentation of norms for speed and quality, printed on the scale, showed the average number of letters written per minute to be from 31 for Grade Two to 79 for Grade Eight, while the average quality of writing found in Grades Two to Eight was from 38 to 62, respectively.

In addition, the scale contained instructions for securing and scoring samples. This feature, together with its convenient size and the fact that only one sample, written in a medium slant, was shown at each step, rendered the Ayres scale a practical instrument for classroom use.

It was evident that these two scales shared a serious drawback: there was only one set of handwriting specimens for all grades. A teacher faced with the problem of judging the quality of handwriting of the pupils in a particular grade found it difficult to make an adequate evaluation inasmuch as she must compare her pupils' handwriting with that of other grades.

The American Handwriting Scale

Another survey instrument, The American Handwriting Scale (published by A.N. Palmer Company) which overcame this drawback, was constructed by West. Seven specimens of handwriting for each grade level from two through eight were provided. The samples, all on one large sheet, were grouped by grade levels and labelled in order of increasing quality from very poor to excellent. The teacher thus was able to compare her pupils' handwriting with a wide range of samples suited to her very own grade. Norms for speed of writing were also given.

FACTORS AFFECTING HANDWRITING

Survey instruments such as the three described above do not indicate the specific defects which form the basis of illegible handwriting. For this purpose a number of charts, highly diagnostic in character, were developed.

The first of these, Freeman's Chart for Diagnosing Faults in Handwriting (Houghton Mifflin Company), was an analytical scale. It was printed on a large sheet of paper and could be used to evaluate aspects of handwriting such as uniformity of slant, uniformity of alignment, quality of line, spacing, and letter formation. Specimens of handwriting, printed on the chart, were shown for each of these five aspects, and moreover, to illustrate each aspect, three specimens represented highest quality, medium quality, and lowest quality, respectively. The value of the chart was that it enabled the teacher and pupil to discover very readily the good points in a sample of handwriting and to detect easily the areas which were in need of special treatment.

Another chart which required more detailed analysis was developed by Pressey. This chart, called The Pressey Chart for Diagnosis of Illegibilities in Handwriting (Houghton Mifflin Company), was used to record errors in handwriting. On it each illegibility in a pupil's handwriting was analysed and classified, so that a teacher had a record of the specific points at which she should direct remedial work.

Gray devised a score card on which he listed the elements of which he considered handwriting to be composed. This was called A Standard Score

Card for Measuring Handwriting (Public School Publishing Company), and was used for diagnosing faults in handwriting. Values were assigned to the different characteristics of writing, such as heaviness, slant, size, alignment, spacing of lines, words, and letters, neatness, and formation of letters, on the basis of their relative importance. For example, heaviness might have a value as high as three, while formation of letters might be assigned any value up to twenty-six. The total of the values assigned, which was taken as a measure of the general merit of the sample under consideration, was a percentage, as the total points of perfect handwriting would be one hundred. The chief value of this instrument lay in its analysis of handwriting into elements. It might be criticized on the basis of the weight assigned to some of the elements, for example, spacing of lines, a factor with which pupils now seldom have to deal, is given a value of nine, while formation of letters, the basis of legibility, is valued at only twenty-six.

A number of conclusions, reached by the above investigators and others following research, is relevant to the present study and reveals variables in the formation of letters and variables of the writer which affect handwriting.

Variables in the Formation of Letters

One of the earliest studies was conducted by Pressey (Pressey and Pressey, 1927, pp. 270-273), who sought to determine the characteristic types of illegibilities and malformations made by pupils in their handwriting. They revealed that a few letters caused the majority of

illegibilities, because 'r', 'n', 'e', 'a', 'o', 's', and 't' accounted for over half of all illegibilities found. The most troublesome letter was 'r', with 'n' ranking second, while the six most common errors were due to making 'r' look like 'i', 'n' look like 'u', closing the 'e', making 'd' look like 'cl', 'o' look like 'a'. and 'a' look like 'u'. From the findings of this study the Pressey Chart described above was drawn up.

A short time after the Pressey study, Newland (Newland, 1932, pp. 249-258) conducted a similar study in which he analysed 42,284 specific illegibilities and found that only four letters 'a', 'e', 'r', and 't' contribute approximately half of the total number. Of these illegibilities, fifteen per cent were caused by writing 'e' like 'i'. It is interesting to note his revelation that the gross frequency with which illegibilities appeared tended to increase with age.

In 1952 Gray (Gray, 1952, pp. 492-495) made a survey of handwriting, the results of which concurred with previous studies. He found the most troublesome letter to be 'r', and revealed that 'r', 'n', 'e', 'a', 'd', and 'o' accounted for one-half of all illegibilities. He further stated that letter formation is most closely related to legibility and that spacing is next, followed by uniformity of alignment, quality of line, and uniformity of slant.

There seems to be a dearth of research into how each of the components of handwriting affects the total quality. The majority of critics agree with Gray that letter formation is the most important element, and that any program of remedial instruction must first deal with that area. A few leaders in the diagnostic and remedial field have commented on the

The first part of the paper discusses the importance of the study of the history of the English language. It is argued that the study of the history of the English language is not only a matter of academic interest but also of practical importance. The paper then goes on to discuss the various factors which have influenced the development of the English language over the centuries. These factors include the influence of other languages, the influence of social and cultural changes, and the influence of technological advances. The paper concludes by stating that the study of the history of the English language is a fascinating and important field of study.

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importance of slant as follows: "The more writing slants, and the more the letter forms deviate from ordinary printed type face, the harder it is to read." (Hildreth, 1947, p. 631). Cole also observes that "consistency in slant should be required for legibility and appearance." (Cole, 1941, quoted in Hildreth, 1947, p. 631). Another researcher (Quant, 1946, pp. 297-316), states that regularity of slant and compactness of spacing are the factors which favor legibility.

Variables of the Writer Which Affect Handwriting

Many investigators sought to determine the relation between the quality of handwriting and the sex, grade, age, instrument used, handedness, and the intelligence of the writer; and between the quality of handwriting and the speed of writing.

Sex

In 1906 Gesell (Gesell, 1906, pp. 394-404) made a study in which he related handwriting to intelligence and sex. He disclosed that two-thirds of the very best specimens were written by girls, while almost three-quarters of the very worst specimens were written by boys. Later, Burt (Burt, 1922, p. 311) reinforced Gessell's findings by concluding that "Girls write faster at every age and write a fairer hand than the boys."

Grade Level

A study of the standards proposed for quality in handwriting by the compilers of handwriting scales shows a gradual increase grade by grade. Thorndike's Scale indicated that an increase from 7 to 11 in Usual Quality and from 8.5 to 12.5 in Best Quality should be expected from Grades Two

to Eight, while Ayres suggested that the increase should be from 38 to 62 between these two grades. Likewise, Freeman's Chart showed a rise in quality from forty-six in Grade Four to fifty-four in Grade Six. "At this stage speed and quality both tend to increase, the latter only slightly." (Brueckner and Bond, 1955, p. 385).

Instrument Used

In a compilation of data regarding the preference of writing instruments, Herrick (Herrick, 1960, p. 254) writes:

The Wisconsin Survey (Arnold, Gen F., Paul W. Eberman, Theodore L. Haris, and Virgil E. Herrick, "Handwriting in Wisconsin," Madison, Wisconsin: School of Education, University of Wisconsin, 1951) of the specific instruments used in handwriting programs found the following in indicated order: adult pencil, beginner pencil, fountain pen, chalk, crayon, ball point pen, pen and holder, and the mechanical pencil.

The adult pencil is most frequently used, with fountain and ball point pens increasing in use. The least used instruments are the mechanical pencil and the pen holder and steel nib. In a study of instrument preference, Herrick (Herrick, Virgil E., "Preferred Types of Handwriting Instruments," Unpublished Research Report, University of Wisconsin, 1954) found that the preferred writing instruments were: fountain pen, ball point pen, and adult pencil. Otto (Otto, Henry J., "Use of Ink and Fountain Pens in the Elementary School," Elementary School Journal, 48 (March, 1948, pp. 379-384) found that in 1948 the majority of large city school systems still restricted the initial use of ink to the pen holder and steel pen. In slightly more than one-half of the schools, however, permissive use of fountain pens was given. Wiles (Wiles, Marian Elizabeth, "The Effect of Different Sizes of Tools Upon the Handwriting of Beginners," Doctor's Thesis, Harvard University, 1940) showed that there is no evidence to support the use of the beginner's pencil as an initial writing instrument for children. What evidence there is favors the size of the adult pencil. Whittaker (Whittaker, Forrest Marion, "An Experimental Study of the Relative Efficiency of Steel Pens and Fountain Pens in Teaching Penmanship," Unpublished Master's Thesis, University of Southern California, 1934) in his study of the efficiency of steel pens and fountain pens found that fountain pens produced writing of higher quality and were preferred by children as writing instruments. The evidence seems to support the use of fountain and ball point pens in programs of writing instruction.

From her observations in classrooms Cole (Cole, 1934, p. 119) made some pointed comments on the use of pen and ink.

Writing with a pen and ink is almost completely outmoded. Since fountain pens can now be acquired for a few cents there would seem no good reason why every child should not have one. The defenders of penmanship as a fine art will object to the fountain pen, of course. However, penmanship is a practical tool and not a fine art. Hence, it is more sensible to train children to write well with the implement they will use than to write well with an implement they will not use if they can help it. Writing laboriously with pen and ink, pushing a fine point through the paper, spattering ink blots around, smearing the fingers and clothes with ink, getting tense and nervous from strain--all of this is unnecessary torture performed out of respect to a fetish long since become archaic.

In a similar vein Hildreth (Hildreth, 1947, p. 631) observes, "We may still find children using old-style pens and inkwells in the classroom, but try in vain to find such equipment in the modern living-room."

It will be noted that these studies, with the exception of Whittaker's, are concerned with instrument preference. Regarding the relative performance of pupils using different instruments, this investigator found no further research. However, a 1960 report (Templin, 1960, pp. 161-163) describes the results of a comparative study of the legibility of the writing of 454 adults.

Both men and women listed the pencil as the writing tool they used most often (preferred by one-half of the men and more than one-quarter of the women). The ball point pen was second choice of men (29%) and first choice of most women (37%). 67% of all men and 64% of all women reported that they made some use of a fountain pen.

Critics of the ball point pen will be interested to note that she discloses:

According to the judges and the juries who took part in this survey, the use of the ball point pen seemed to have an adverse affect on legibility. They noticed an unevenness in the writing on nearly every sample written.

Whatever implications this may have for the teaching of handwriting in today's schools remains doubtful. Templin concludes by saying, "The ball point pen seemed to have widespread acceptance, but there were many indications that it is used most extensively by men and women who do little writing."

Handedness

Several studies have been conducted for the purpose of determining how handedness affects the speed and quality of writing. In the Detroit Elementary Schools Beeley (quoted in Gray, 1938, p. 121) investigated and compared the speed and quality of handwriting of left-handed and right-handed children. He found that the average speed of the left-handed children was almost exactly the same as that of the whole group, while average quality of the writing of left-handed children was found to be 2.7 per cent poorer than that of the whole group.

To support these findings, a similar investigation (Clark, 1957, p. 197) was conducted in Scotland to ascertain the laterality characteristics of children. On the basis of tests given to a group of 330 children, Clark showed, "when both quality and speed were considered, ... there was no tendency for the left-handers as a group to be poorer or slower than right-handers of the same sex, class, and intelligence."

In direct contrast to these two studies are the findings of Burt (Burt, 1937, p. 319), Garrison (quoted in Smith and Reed, 1959, p. 68), and Guilford (Guilford, 1936, p. 39).

Burt said that

... in actual tests for quickness, I find that on an average the left-handed reach only four-fifths of the speed of the right-handed. This means that, other things being equal, in the written exercises of the classroom or at a written examination, the right-handed pupil can get through twenty per cent more work in the same amount of time.

Garrison substantiated this by the statement: "Not only does the left-hander write with considerable tension, but his writing is significantly slower than that of other children of his age and grade level." And, in confirmation, Guilford observes that "... the left-handed children do not rank on par, in quality and speed, with those using the right-hand." In this see-saw of results, the latest study to be made supports Beeley and Clark. Smith and Reed (Smith and Reed, 1959, pp. 67-76) found that

... while the results show a tendency for the right-hand groups to write more rapidly than the left-hand groups when both sets of children used the preferred hand, the difference in writing speeds is not statistically significant. The assumption that the left-hand writer's problems necessarily result in slower handwriting cannot be supported by the results of this study. Neither handedness nor sex has affected the results of our tests.

Intelligence

Although intelligence is not intimately involved with the writing movement itself, many people have opinions regarding its influence on the product. One of the first investigations in this field was made in 1906 (Gesell, 1906, pp. 394-404, quoted in Gray, 1938, p. 112). He concluded that there is a tendency for accuracy in children's writing to vary directly with school intelligence. As improved methods in determining intelligence and evaluating handwriting came to be employed,

however, this conclusion was discounted. Terman (Terman, 1926, quoted in Schonell, 1948, p. 90) found, in his study of gifted children (those with intelligence quotients over 130), that:

... the gifted are weakest in subjects which require manual dexterity. Writing, art and handwork account for 68 per cent of the weaknesses reported for the gifted as against 16 per cent for the control group representing a sample of ordinary school population with IQ's from 80 to 130.

This supported a study made two years earlier by Gates and LaSalle (Gates and LaSalle, 1924, pp. 205-216, quoted in Gray, 1938, p. 113) in which they made tests over a period of twenty months in order to correlate writing with age, other school subjects, and intelligence. Their conclusion was that "writing ability is correlated slightly, if at all, with intelligence."

Saudek (Saudek, p. 35, quoted in Schonell, 1948, p. 319) gave certain reasons for this lack of correlation:

... it is the bright rather than the dull child whose impetuous nature rebels most strongly against the conventions of orthography. Their writing provided a psychological portrait of the impatience and impetuosity of their nature. It was wide and irregular both in shape and alignment. Joinings and completions of letters were slovenly while crossings-out and alterations were numerous, the latter a trait which rather betokened acting first and thinking afterwards.

Relationship Between Variables

Researchers wondered what the result would be if an attempt were made to increase speed and/or quality of handwriting, and consequently several studies were made for this purpose. The first of these seems to have been a survey by Judd (Judd, 1916, cited in Monroe, 1917, p. 183) from which he concluded that "in general, speed and quality vary inversely."

DeVoss and Kelly (quoted in Monroe, 1917, p. 183) claimed that "children who write a good quality on the average write as rapidly as those who write a poorer quality. This seems to be due to the natural rhythm of the children." However, they go on to say: "If this rhythm is forced or disturbed unduly the quality suffers." Thorndike (quoted in Monroe, p. 183) in 1910 had affirmed that causing a pupil to write more slowly than his normal rate did not improve the quality of the handwriting. In 1931 Wheat (Wheat, 1931, p. 272) took the position that "...one seems justified in concluding that speed and quality are mutually antagonistic characteristics and that either is improved at the expense of the other."

SUMMARY

The research reviewed in this chapter was concerned with 1) handwriting scales and diagnostic charts, and 2) variables which affect the quality of handwriting.

The majority of these studies was not of recent date, nor did any of them deal with handwriting in the Province of Alberta. A study which would review some aspects of the handwriting of pupils in this province would therefore seem to be of value at this time.

CHAPTER III

PLAN OF THE RESEARCH

The procedures followed in order to carry out the purposes of the study are discussed below under the headings 1) Method Used to Obtain a Representative Sampling, and 2) Treatment of Data.

METHOD USED TO OBTAIN A REPRESENTATIVE SAMPLING

Approximately five hundred samples of handwriting were required from each grade of grades four, five, and six in schools throughout the Province of Alberta. The method used to obtain the samples will be outlined under types of schools, selection of schools, selection chosen to be copied, and distribution of material to teachers.

Types of Schools

To ensure that samples were collected from schools which would be as nearly representative as possible of the various types found in Alberta, the investigator grouped schools into categories according to the number of classrooms in operation in each school selected. This resulted in four categories, namely, one-room schools, two to five-room schools, six to ten-room schools, and lastly, the schools of the two largest cities, Edmonton and Calgary.

Selection of Schools

From a list of superintendents of Alberta school districts, divisions, and counties, the names of a number of superintendents were chosen by chance. Each of these superintendents was then contacted and asked for

permission to conduct the survey in his area (Appendix A). He was further asked, in the event of his approval, to choose from his superintendency one school which was representative of each of the first three categories mentioned above, and to list the names of the principal, and the teachers in those schools who were teaching grades four, five, and six (Appendix B).

Upon receipt of the superintendent's approval and the list of teachers' names which he had submitted, letters were sent to the principal and teachers designated (Appendix C, D) outlining the purpose of the study, and requesting their assistance in obtaining samples from their school. Each teacher willing to assist was asked to return a form (Appendix E) showing the number of rooms in her school and the number of pupils in the grade which she taught. This information was necessary for the purpose of categorizing the samples when returned, and for determining the amount of material to be sent to the teacher.

From the information received from the teachers regarding the number of rooms in the schools, the investigator found that there were so many schools, apart from the two large cities, with more than ten rooms that it was decided at this point to have an additional category E, which would represent this size of school.

Selection Chosen to Be Copied

The nature of the material which the pupils are asked to write may influence the sample of handwriting produced and so a selection chosen for copy should contain familiar, simple, and easily-understood material (Greene et al, 1953, p. 452). The first verse of "Escape at Bedtime" (Appendix F), by Robert Louis Stevenson, chosen as the selection for the

pupils to copy, fulfills these requirements by virtue of its inclusion in the Canadian Parade Series of Readers authorized at the Grade Four level in Alberta. It had the additional merit of containing twenty-one of the twenty-six letters of the alphabet, seventeen of which occurred in the first line, twenty in the first two lines, and twenty-one in the first three lines, while no further letters appeared in the succeeding lines. The letters of the alphabet which do not appear in the selections are j, q, x, y, and z, which compares favorably with the Ayres Measuring Scale for Handwriting, in which the letters j, k, x, and z do not occur.

Distribution of Material to Teachers

One hundred nine teachers who had indicated that they would assist in the survey were mailed sufficient printed copies of the selection, "Escape at Bedtime", so that each of her pupils might have one copy.

Since the investigator felt that greater uniformity in the samples would be ensured by providing each student with identical sheets upon which the test was to be written, these were also sent to the teacher together with instructions to follow prior to having her pupils take the test (Appendix G and Appendix H). She was asked to have the pupils memorize the selection well enough so that they could write it from memory without having to stop to think of the words or worry about how to spell them. This was considered to be necessary inasmuch as a single specimen of handwriting was to be used to obtain both quality and rate scores. Unfamiliar material might have forced the children to pause over difficult or unknown words, with the result that no typical rate would be secured.

The teacher was also asked to have the pupils take the actual test

during the third week in March, since obtaining the samples at a specified time would ensure that all pupils had had the same period of tuition that year. As a consequence, the results would then have an added measure of uniformity.

A separate sheet was also enclosed with instructions which would guide the teacher in obtaining the samples of handwriting (Appendix I). She was asked not to have any of the poem in writing on the chalkboard while the pupils were writing the test, so that the pupils would not be deterred in any way from their writing. She was also asked to have each pupil write with the pen he ordinarily used and to see that it was in working order. The pupils were then to be given identical sheets on which the writing was to be done, and on which he was asked to give information regarding his sex, age, grade, handedness, and type of pen used.

The time limit was to be two minutes, as this would be long enough to permit the rate and quality scores to be representative of the writing of the pupils and not so long as to prove fatiguing and thus affect the quality. The teacher was asked to have a watch with a second hand so that the time could be measured accurately.

When the pupils were ready the teacher was asked to tell her pupils to sit in a comfortable position, and to write as well as they could at their usual rate. This direction was felt necessary as both rate and quality of writing might be influenced by what the pupils were told to do. If they were requested to write as rapidly as they could, their rate score would increase and probably their quality scores would be lower. The reverse could also be true, and so the factors of speed and quality were given equal stress.

The teacher was then asked to tell her pupils that they were to start writing when she said the word "begin", to write from memory as much of "Escape at Bedtime" as they were able to do in two minutes, and when she said "stop" to put the pen down immediately, even if they had not finished a letter.

The teacher was then to have the pupils write the test under the above conditions and to collect the papers immediately after the test was over. She was asked to fill in the intelligence quotient of each pupil in the designated space, place all samples in the stamped, addressed envelope which had been provided and mail to the investigator. Samples were received from one hundred six classrooms.

ANALYSIS OF DATA

The entire sampling was analysed for two purposes, first, to determine speed of writing, and secondly, for general appearance. Within the scope of the thesis it was manifestly impossible to evaluate all the samples according to the criteria of letter formation, spacing, slant, size and alignment, and quality of line as established from Bulletin 3, Program of Studies for the Elementary School (1950, pp. 10-11). Accordingly, one hundred samples, representing approximately ten per cent of the total samples, for each grade were drawn using a table of random numbers (Kenney and Keeping, 1954, pp. 330-333), for the purpose of complete evaluation, which will be discussed below under the respective headings of each characteristic.

Analysis of Total Population

The samples from each grade were treated separately but identically. When the samples were received by the investigator, each sample was numbered and lettered according to the grade, the category of school, and the numerical order in which it arrived. Arabic numbers were used to identify the grade and numerical order, while the letters A, B, C, D, and E were used to identify samples from one-room, two to five-room, six to ten-room, over ten-room, and city schools, respectively. Thus the first grade four sample received from a one-room school was designated 4A-1.

The information regarding sex, grade, age, type of pen used, handedness, and I.Q. contained on each sample was then transferred to a master sheet. Any sample on which the data pertaining to this information was incomplete was marked and later withdrawn. A number of samples were inadmissible because they had been written with pencil. Those on which the entire selection was written were likewise not analysed, as it appeared that the time limit of two minutes had been exceeded.

Speed of Writing

The number of letters written on each sample was then counted. A letter was judged to be complete if it were recognizable. The total number of letters written was divided by two to give the speed of writing in letters per minute and this figure was transferred to the master sheet.

Quality

In order to determine a mark which could be assigned to each sample to indicate the quality of the handwriting, the investigator used a score

sheet (Appendix J) on which were arranged six characteristics which appeared to affect the quality of any sample of handwriting. These characteristics, which followed closely the suggestions in Bulletin 3, of General Appearance, Formation of Letters, Spacing, Slant, Quality of Line, and Size and Alignment, were assigned marks ranging from twenty-five to two, as shown on the score sheet, according as the sample was judged to be excellent, good, average, fair or poor. Thus a sample which rated excellent in all six characteristics would have a mark of one hundred, while the lowest mark which should be assigned to any sample was twenty.

General Appearance

A committee of three teachers, chosen on the basis of having had actual teaching experience in grade four, five, or six classrooms, met with the investigator and judged all the samples which had been accompanied by complete data, from the standpoint of general appearance, the criteria of which were legibility and neatness. Samples from each grade were judged separately and identically, the judges working separately and then as a group in order to give the greatest degree of validity possible to the final assessment.

Those samples which were judged in the opinion of the committee to have the very best appearance, were placed in one pile and labelled excellent. Those which were judged to be the very worst were placed in a separate pile and labelled poor. The remainder of the samples for that grade were then sorted into three separate piles, according as to whether the general appearance was good, average, or fair, and were so labelled. There were then five piles of samples for each grade, namely, 'best', 'good',

'average', 'fair', and 'poor'. The mark for general appearance of each sample was then entered in the proper space on the score sheet.

Complete Analysis of a Sample

The investigator wished to draw the one hundred samples for complete analysis in such a manner that the total population of Grades Four, Five, and Six throughout the province would be represented as nearly as possible according to the number of pupils in each of the categories of schools designated previously as A, B, C, D, and E.

Consultation of the Fifty-Fifth Annual Report of the Department of Education, 1960 of the Province of Alberta (Department of Education, 1961) supplied the figure for one category only, namely the schools of the two largest cities, Edmonton and Calgary. The number twenty-seven was chosen as the total samples to be drawn for the E category representing these schools as this number approximated the percentage of Grades Four, Five and Six pupils enrolled in these schools when compared with the total enrolment of those grades in the province. An estimation was then made of the number of pupils in the other five categories of schools and a percentage was derived which would be an approximation of the relation those bore to the total school population.

The percentage thus calculated for each category resulted in the sample being drawn in the following proportions: four, fourteen, twenty-five, thirty, and twenty-seven from the A, B, C, D, and E categories of schools, respectively.

The one hundred samples from each grade which had been drawn for complete analysis were then judged for the five remaining characteristics

previously mentioned, according to the criteria established in Bulletin 3.

The evaluation was done by a committee of seven teachers, the members of which had the same qualifications as those which judged the samples for general appearance. For purposes of evaluation, the first two lines only of the selection were considered, inasmuch as they contained twenty letters of the alphabet, and the entire selection would have yielded consideration of but one additional letter.

In order to expedite the calculation of the marks assigned for formation of letters, spacing, slant, quality of line, and size and alignment, a form was used (Appendix K) and only one characteristic was scored at a time, each independently of the others.

Formation of Letters

Each letter was compared to the script form in Bulletin 3 (p.11), and if there was any deviation from this form it was then considered to be an error. The total number of errors in the first two lines of writing were counted and a mark assigned according to the following scales:

0 -	3 errors	----	25
4 -	6 errors	----	20
7 -	9 errors	----	15
10 -	12 errors	----	10
13 up	errors	----	5

The mark assigned for Formation of Letters was then entered on the score sheet.

Spacing

To arrive at an evaluation for this characteristic, both the space between the letters and that between words were considered. A sample which

had uniform spacing between letters and words was considered to be perfect, while any evidence of crowding of letters or words, or of too wide spacing between letters or words, was counted as an error. According to the degree to which each sample adhered to the principle of uniformity of spacing between letters and words, values from fifteen to three were assigned as follows:

0 -	3 errors	----	15
4 -	6 errors	----	12
7 -	9 errors	----	9
10 -	12 errors	----	6
13+ up	errors	----	3

This mark was then recorded on the score sheet.

Slant

To determine the value to be assigned to slant, three sets of parallel lines were drawn on sheets of transparent paper: 1) a set at a thirty-degree forward angle; 2) a set at a ninety-degree angle; 3) a set at a thirty-degree reverse angle (Appendix L). This sheet, used as the standard, was superimposed on each sample to be judged. If a sample contained writing with a thirty-degree, forward, uniform slant, it was considered perfect, while any deviation from this standard was counted an error. The marks for slant, which ranged from 15 to 3, were calculated on the same basis as those for spacing and were then recorded on the score sheet.

Quality of Line

To evaluate quality of line, the samples having uniform, distinct, and smooth lines were judged to be perfect. Any evidence of deviation

from these three criteria was counted as an error. Values from ten to two, subsequently entered on the score sheet, were allotted in the following manner:

0 - 3 errors---	10
4 - 6 errors---	8
7 - 9 errors---	6
10 - 12 errors---	4
13+ up errors---	2

Size and Alignment

To appraise size and alignment, three criteria, as set forth in Bulletin 3, were considered: that of size of letters, relative heights of the various letters, and adherence to the base line. Those samples which met these conditions were judged to be perfect, and any deviation in size of letters, in the relative heights of the various letters, or in adherence to the base line was judged to be an error. The total assigned mark for size and alignment together was ten. It was calculated on the same basis as that for Quality of Line and entered on the score sheet.

The total score for quality was then found by adding the score for each of the six characteristics, and was then transferred to the master sheet.

Malformation of Letters

In addition to the analysis just described, the one hundred samples from each grade chosen for analysis for quality were then examined to determine which letters had been incorrectly formed. The sample was compared with the script shown in Bulletin 3 (p. 11), and any letter which varied from this was judged to be a malformation. A letter was counted

only once; that is, on each sample no account was taken of the number of times each letter was incorrectly formed.

SUMMARY

This chapter has dealt with the method used to obtain handwriting samples and with the treatment of data. Samples were written by pupils of grades four, five, and six in schools having one room, two to five rooms, six to ten rooms, and more than ten rooms, in districts, divisions, counties, and cities in Alberta. These samples were written in accordance with directions sent each teacher who had consented to participate in the study. All samples were analysed for speed of writing and one characteristic of quality, general appearance. One hundred samples for each grade were further analysed for five additional characteristics of quality, formation of letters, spacing, slant, quality of line, and size and alignment. The mark assigned for speed and quality for each sample analysed was then tabulated on a master sheet.

In addition, the one hundred samples from each grade which had been analysed for speed and quality were examined for malformation of letters.

Analysis of the data and the summary of the findings will be the subject of the next chapter.

CHAPTER IV

ANALYSIS OF DATA AND INTERPRETATION OF RESULTS

This chapter deals with data compiled from the analysis of the specimens of handwriting received. Eighteen tables indicate information about the association between rate and quality of handwriting and certain variables, namely, type of school, sex, grade, age, type of pen used, handedness, and intelligence; and one table deals with the analysis of malformation of letters.

Of 2769 specimens of handwriting from Grades Four, Five, and Six pupils, obtained from one hundred six classrooms in five different categories of schools, 572 were withdrawn for lack of information regarding sex, age, grade, type of pen used, handedness, and Intelligence Quotient; thirty-three specimens, which represented those from an entire class, were not used because they had been written with pencil; thirty-eight were inadmissible as the investigator judged that the time limit of two minutes had been exceeded inasmuch as the entire selection had been written; an additional twenty-eight had been written on paper other than that provided, which necessitated their withdrawal, and twelve others were not analysed because the writers obviously did not know the poem.

From the remaining 2086 specimens, data dealing with rate of handwriting and seven variables, namely, type of school, sex, age, grade, type of pen used, handedness, and I.Q. were obtained. For the purpose of comparing achievement of the pupils with respect to the variables under study, the raw scores were converted to stanines. Contingency tables were prepared and the χ^2 test applied for association between rate of

handwriting and the seven variables listed above. The .05 level of significance was accepted as the basis for testing the hypotheses.

TABLE 1
ASSOCIATION BETWEEN RATE OF HANDWRITING AND SEVEN VARIABLES

Variable	χ^2	df	Level of Significance
Type of School	83.365	24	.01
Sex	8.206	8	.50 > p. > .30
Grade	184.485	16	.01
Age	121.04	24	.01
Type of Pen Used	115.92	16	.01
Handedness	7.60	8	.50 > p. > .30
Intelligence	50.34	40	.05

DESCRIPTION OF TABLES

Table 1 shows the association between rate of handwriting of all the specimens and seven variables, type of school, sex, grade, age, type of pen used, handedness, and intelligence. In the first column is a list of the variables; in the second, the value of chi square (χ^2); in the third, the degrees of freedom (df); while in the last column is the level of significance.

Tables 1.1 to 1.7 show the raw scores, converted into stanines, in

contingency tables for rate of handwriting and the seven variables listed in Table 1. The first column on the left shows the variables under consideration, the last column on the right shows the total number of cases, while the intervening columns represent the stanines. In some instances the stanines at the extremities of the table have been combined in order to provide a sufficient number of cases in each cell. Below each table the value of χ^2 , the number of degrees of freedom, and the level of significance are given.

Table 2 shows the representation of certain variables in the sample drawn for complete analysis, compared to the total group. The table is made up of five columns which list in order the variables, the number of the total group, the number in the sample drawn, the \bar{Z} ratio, and the difference between the representation of the variables in the sample with that of the total group. Below the table the number in the total group and the number in the sample are given. Any differences in the totals is due to a machine error, which does not affect the result.

Table 3 shows the association between quality of handwriting in the sample drawn for complete analysis and eight variables, rate of handwriting, type of school, sex, grade, age, type of pen used, handedness, and intelligence. In the four columns of the table are listed the variables, the value of χ^2 , the degrees of freedom (df), and the level of significance, in that order.

Tables 3.1 to 3.8 record the raw scores, converted into stanines, in contingency tables for quality of handwriting and the eight variables listed in table 3.

Table 4 shows the number of malformations of letters by grade, and then the number by the grades combined, of Grades Four, Five, and Six.

ASSOCIATION OF RATE OF HANDWRITING AND CERTAIN VARIABLES

The data pertaining to these variables will be discussed in the order in which each variable appeared on Table 1.

TABLE 1.1.

CONTINGENCY TABLE OF STANINES FOR RATE OF HANDWRITING AND TYPE OF SCHOOL

Type of School	Stanines							Total (N)
	1 - 2	3	4	5	6	7	8-9	
A	0	2	4	3	6	6	5	26
B	36	25	29	50	36	40	28	244
C	49	65	83	101	104	76	72	550
D	91	110	173	228	175	102	82	961
E	58	45	55	47	38	21	41	305
Total	234	247	344	429	359	245	228	2086

$$\chi^2 = 83.365 \quad df = 24 \quad \text{sig. @ } p < .01$$

Type of School

As will be seen from Table 1.1, the application of the χ^2 test shows the association between rate of handwriting and type of school to be significant at the .01 level; χ^2 is equal to 83.365. This warrants rejection of the hypothesis that there will be no correlation between rate of handwriting and type of school. It is not possible to conclude from the data the direction of the difference from school to school, nor does an examination of the data suggest the exact nature of this direction. However, comparison of the number of pupils in each stanine with the total for that type of school shows almost 20% of the pupils in A category schools in the top level of achievement as compared to 12%, 13%, 9%, and 13% of pupils in B, C, D, and E categories of schools respectively. There were no pupils of A category schools writing at the slowest rate although the number in the other categories of schools who wrote at that rate, with the exception of C category, was always greater than the number who wrote fastest. As the size of school increased, the percentage of pupils writing at lower rates also tended to increase. On the basis of this study it would appear that the size of the school tends to have some bearing on the rate of children's handwriting, and from that the inference might be drawn that there tends to be some factor which affects the rate of handwriting of the children in the different types of schools.

No research was found which deals with the rate of writing in schools of different sizes and therefore no comparison could be made.

TABLE 1.2.

CONTINGENCY TABLE OF STANINES FOR RATE OF HANDWRITING AND SEX

Sex	Stanines									Total (N)
	1	2	3	4	5	6	7	8	9	
M	45	83	131	167	207	178	116	73	33	1033
F	37	69	116	177	222	180	129	71	51	1052
Total	82	152	247	344	429	358	245	144	84	2085

$$\chi^2 = 8.206$$

$$df = 8$$

$$\text{Sig. @ } .50 > p > .30$$

Sex

The application of the χ^2 test to the rate of handwriting scores and sex of the writer gave χ^2 a value of 8.206, significance at the .50 level and probable significance at the .30 level. Within the level of significance established as acceptable, this study does not reveal that there exists a significant association between rate of handwriting and the sex of the writer. Examination of the stanines of Table 1.2 shows approximately forty-one per cent of the boys' handwriting fell in the bottom four stanines, while thirty-eight per cent of the girls' handwriting was on this level. Conversely, thirty-eight per cent of the boys' and forty-one per cent of the girls' handwriting ranked in the sixth or higher stanines. The percentage of total samples from both boys and girls which fell in the fifth stanine was almost equal, 9.9% and 10.6% respectively.

On the basis of this data it would appear that there is no tendency for one sex to write faster than the other. These findings concur with those of Smith and Reed (Smith and Reed, 1959, p. 76). They do not, however, support an earlier study (Burt, 1922, p. 311) which concluded that girls of every age write faster than boys.

TABLE 1.3.

CONTINGENCY TABLE OF STANINES FOR RATE OF HANDWRITING AND GRADE

Grade	Stanines									Total (N)
	1	2	3	4	5	6	7	8	9	
IV	45	85	125	139	162	96	52	23	6	733
V	33	40	75	116	133	123	101	57	38	716
VI	4	27	47	89	134	140	91	64	40	636
Total	82	152	247	344	429	359	244	144	84	2085

$$\chi^2 = 184.485 \quad df = 16 \quad \text{sig. @ } p <<< .01$$

Grade

Table 1.3 shows the value of χ^2 is 184.485 in the test applied for association between rate and grade. This association was significant at the .01 level. Examination of the stanines of Table 1.3 suggests a tendency for the rate of handwriting to increase by grades. The data indicates a tendency for Grade Six pupils to write fastest, followed by Grade Five, and Grade Four in that order. The greatest number of slow writers and the least number of fast writers appeared to be in Grade Four, while the greatest number of fast writers and the least number of

slow writers appeared to be in Grade Six.

This tendency is in line with the assumptions of handwriting experts such as Thorndike (Thorndike Scale for Handwriting of Children, Bureau of Publications, Teachers College, 1910), and Ayres (Measuring Scale for Handwriting, Russell Sage Foundation, New York, 1912) who indicated a continued increase in rate of handwriting grade by grade from Grade Four through Grade Six.

TABLE 1.4.

CONTINGENCY TABLE OF STANINES FOR RATE OF HANDWRITING AND AGE

Age	Stanines									Total (N)
	1	2	3	4	5	6	7	8	9	
8 and 9	30	49	69	90	109	63	35	17	4	466
10	31	58	92	112	124	116	72	33	23	661
11	17	27	61	106	127	112	86	59	43	638
12,13, 14,& 15	4	18	25	36	69	68	52	35	14	321
Total	82	152	247	344	425	355	245	144	84	2086

$$\chi^2 = 121.04 \quad df = 24 \quad sig. @ p < < < .01$$

Age

Of the 2086 specimens analysed for rate of handwriting, only nine were written by eight-year-olds, consequently these were included with the nine-year-old group on Table 1.4. For the same reason, only one group was used to represent ages twelve, thirteen, fourteen, and fifteen.

Table 1.4 shows the value of χ^2 is 121.04, and significance at the

.01 level in the test for association between rate of handwriting and age. A perusal of the stanines of the table indicates a tendency for rate to increase with age from age eight through age eleven. At age twelve, however, there appears to be fewer children who write at the fastest rate, and examination of the scores of children beyond age eleven suggests a tendency towards no further increase in rate, although the rate is apparently maintained at age twelve.

No studies were found which reported comparison between age and rate of handwriting. The Gates and LaSalle study (Gates and LaSalle, 1924, quoted in Gray, 1938, p. 113) possibly contained relative conclusions but this book had been placed in the University of Alberta archives and could not be located.

TABLE 1.5.

CONTINGENCY TABLE OF STANINES FOR RATE OF HANDWRITING
AND TYPE OF PEN USED

Pen Type	Stanines									Total (N)
	1	2	3	4	5	6	7	8	9	
Straight	18	14	27	26	30	11	6	1	1	134
Fountain	18	51	102	125	150	154	78	49	11	738
Ball- Point	46	87	118	193	249	193	161	94	72	1213
Total	82	152	247	344	429	358	245	144	84	2085

$$\chi^2 = 115.92 \quad df = 16 \quad \text{Sig. @ } p < .01$$

Type of Pen Used

From the χ^2 test applied for association between rate of handwriting and type of pen used, Table 1.5 shows a χ^2 of 115.92. There is significance at the .01 level which seems to indicate that there is a tendency for types of pen used to affect the rate of handwriting. Figures from the stanine data of Contingency Table 1.5 show the bulk of straight pen users, almost 63%, to be bunched toward the lower levels of achievement; 22% ranked in the fifth stanine, and almost 15% ranked in the four top stanines. Some 41% of the pupils who used fountain pens were in the four lowest stanines, 20% were in the fifth stanines, while the remaining 39% fell in the sixth to ninth stanines. Of those who used ball point pens, approximately 36%, 20%, and 43% fell in the first to the fourth, the fifth, and the sixth to ninth stanines respectively. While the data seem to indicate a tendency for those who use a ball point pen to write faster than those who use either a fountain or a straight pen, the numbers represented in the sample must be taken into consideration. Only six per cent of the samples were written with a straight pen, while the percentage of those who used a fountain pen was thirty-five, and of those who used a ball point pen, fifty-eight.

No research was found by the investigator which reported studies dealing with the rate of handwriting and the instrument used.

TABLE 1.6.

CONTINGENCY TABLE OF STANINES FOR RATE OF HANDWRITING AND HANDEDNESS

Handed- ness	Stanines									Total (N)
	1	2	3	4	5	6	7	8	9	
Right	73	134	218	310	398	324	221	136	77	1891
Left	9	18	29	34	32	35	24	8	7	196
Total	82	152	247	344	430	359	245	144	84	2087

$$\chi^2 = 7.60 \quad df = 8 \quad \text{Sig. @ } .50 > p > .30$$

Handedness

Application of the χ^2 test for association of rate of handwriting and handedness recorded on Table 1.6 shows a χ^2 of 7.60. Association was significant at the .50 level and probably significant at the .30 level. As this significance is not within the limits established as acceptable, the data from this study would seem to reveal that handedness does not tend to have any effect on the rate of handwriting. Such an observation must necessarily be made with a degree of caution as there were 1891 specimens of handwriting from right-handed pupils and one hundred ninety-six from left-handed pupils. However, inasmuch as nine per cent of the specimens were from left-handed writers, this number was considered sufficiently high for inclusion in this study, as Bulletin 3 (Department of Education, Province of Alberta, 1950, p. 12) suggests that approximately five per cent of all school children are left-handed.

An examination of Table 1.6 shows that forty per cent of the specimens

from right-handers fell in the sixth to ninth stanines inclusive, while twenty-one per cent and thirty-nine per cent fell in the fifth and in the first to fourth stanines inclusive, respectively. The corresponding figures for the left-handed writers were thirty-eight, sixteen, and forty-six per cent in the sixth to ninth, fifth, and first to fourth stanines, respectively.

These figures would seem to show that the right-handed group tends to be composed of a few more individuals who write faster, and a few less who write slower than does the left-handed group, although the number is not significantly greater in either extreme.

Research has failed to determine conclusively whether or not handedness affects the rate of handwriting. Three studies (Beeley, quoted in Gray, 1938, p. 121; Clark, 1957, p. 197; and Smith and Reed, 1959, pp. 67-76) report that it did not, while three other studies (Guilford, 1936, p. 39; Burt, 1937, p. 319; and Garrison (quoted in Smith and Reed, 1959, p. 68) disclose that left-handed writers do not write with a speed equal to that of right-handers.

TABLE 1.7.

CONTINGENCY TABLE OF STANINES FOR RATE OF HANDWRITING AND INTELLIGENCE

Intelli- gence Quotient	Stanines									Total (N)
	1	2	3	4	5	6	7	8	9	
40-89	5	8	20	15	22	28	13	9	5	125
90-99	14	20	42	44	74	52	42	20	7	315
100-109	33	56	81	103	128	99	72	41	17	630
110-119	13	45	71	112	125	104	71	40	28	609
120-129	13	19	23	59	63	57	36	27	19	316
130-169	4	4	10	11	17	19	11	7	8	91
Total	82	152	247	344	429	359	245	144	84	2086

Convert to "t" using: $\chi^2 = 50.34$ $df = 40$
 $t = \sqrt{2\chi^2} - \sqrt{2 df - 1}$ Not sig. @ .05 level

Intelligence

When the χ^2 test was applied for association between rate of handwriting and intelligence, the value of χ^2 was found to be 50.34. χ^2 was converted to "t" using $t = \sqrt{2\chi^2} - \sqrt{2 \text{ df} - 1}$ because the number df > 30 (Guilford, 1956, p. 116). Inasmuch as the association was not significant at the .05 level there was no basis for assuming that there is a tendency for a significant relationship to exist between rate of handwriting and scores on intelligence tests.

Table 1.7 shows the number of cases, in each of the stanine ranks, grouped according to levels of I.Q. It will be seen from this data that there is no tendency for any pattern to develop with regard to rate of handwriting and intelligence.

The findings in this study cannot be compared with other studies relating to intelligence, as the latter deal with "accuracy", "ability", and letter formation. (Terman, 1926; Gates and LaSalle, 1924; Saudek, 1959).

Summary of Rate of Handwriting and Seven Variables

An examination of Table 1 shows that on the basis of the results obtained from this study the relationship between rate of handwriting and type of school, age, grade, and type of pen used had χ^2 at levels which were significant. It would appear, therefore, that there is a tendency for rate of handwriting to be affected by the foregoing variables. On the other hand, the table indicates that there does not appear to be any tendency for rate of handwriting to be affected by sex, handedness, and intelligence.

TABLE 2
RELIABILITY OF THE SAMPLE

Variable		Total Group	Sample	\bar{Z}	Difference
Sex	Female	1052	135	2.001	probably significant @ .05 → .01
	Male	1033	164		
Type of Pen Used	Straight	134	8	4.33	significant
	Fountain	738	95	1.236	not significant
	Ballpoint	1213	186	1.565	not significant
Handedness	Right	1890	277	1.460	not significant
	Left	196	22		not significant
Type of School	A	26	12	1.8375	not significant
	B	244	42	1.2634	not significant
	C	550	73	.8536	not significant
	D	961	91	6.349	significant @ .01
	E	305	81	5.24	significant @ .01
Age in years	8	10	2	.4418	not significant
	9	457	59	1.0287	not significant
	10	661	90	.6476	not significant
	11	637	100	1.149	not significant
	12	265	39	.188	not significant
	13	43	7	.3460	not significant
	14	(11	-	.1163)	not significant
	15	(2	2)	

Total Group N = 2086

Sample N = 299

ASSOCIATION OF QUALITY OF HANDWRITING AND CERTAIN VARIABLES

From the 2086 specimens which were examined with respect to the association between rate of handwriting and certain variables described above, three hundred, representing one hundred for each grade of Grades Four, Five, and Six, were drawn for complete analysis by means of a table of random numbers.

Reliability of Sample

The formula (Guilford, 1956, p. 198)
$$\sigma_p = \frac{\sqrt{\frac{pq}{N} (1 - \frac{N}{N_p})}}{\sigma_p}$$

is distributed as \bar{z} was applied to determine whether or not the sample of 300 specimens was representative of the total number of 2086 specimens obtained with respect to the variables rate, type of school, sex, grade, age, type of pen used, handedness, and intelligence.

The data shown on Table 2 is recorded in the following manner: the first column lists the variable; the second shows the number of specimens in the total group; the third column contains the number in the sample drawn; the fourth column is the value of \bar{z} ; and the fifth column indicates whether or not the difference is significant.

A significant difference will be noted in the sex ratio in that there were twenty-nine more male samples drawn than female samples. As the total group was composed of slightly more females than males, it may be assumed that the number drawn from the sample resulted purely from chance.

With regard to the significant difference noted for pen type, it was to be expected that a very small number would be drawn in the sample, as a very small percentage (six per cent) of the total specimens were written

with a straight pen. The number of specimens written with a straight pen in the sample bears a comparable relationship to the number so written in the total group.

There is also a significant difference in the number drawn for the D and E types of schools. These two categories represented the schools containing more than ten classrooms, and the city schools, respectively. The investigator wished to work on a percentage basis and for this reason drew one hundred samples for each grade. The only known figure which could be used to determine the proportion of students in each category of school was obtained from the Report of the Department of Education, Province of Alberta (Department of Education, 1961). This report indicated that the number of pupils in Grades Four, Five, and Six, in the two large city schools was approximately twenty-seven per cent of the total population of these grades. This figure, then, was used as a basis for estimating the number which would represent the other categories of schools. The investigator had requested teachers who were assisting in the study to submit specimens of handwriting from all the pupils in grades four, five, and six in each school selected by the superintendent. More specimens were obtained from the D and E than from the other categories. The significant difference, therefore, arises as a result of the estimated number of samples which should be drawn from each category.

Analysis of Quality

Data dealing with the quality of handwriting and eight variables, rate of handwriting, type of school, sex, grade, age, type of pen used, handedness, and I.Q., which had been obtained from the three hundred

specimens, were subjected to the same statistical treatment as that for rate. Table 3 gives the composite results between quality of handwriting and the eight variables.

TABLE 3.

ASSOCIATION BETWEEN QUALITY OF HANDWRITING AND EIGHT VARIABLES

Variable	χ^2	df	Level of Significance
Rate	6.67	4	.20
Type of School	8.499	8	.50
Sex	26.743	2	.01
Grade	87.306	16	.01
Age	12.044	8	.20
Type of Pen Used	7.406	4	.20
Handedness	1.557	2	.50
Intelligence	2.588	4	.70

The data pertaining to the variables will be discussed in the order in which each variable appeared on the above Table 3.

TABLE 3.1.

CONTINGENCY TABLE OF STANINES FOR QUALITY OF HANDWRITING
AND RATE OF WRITING

		Rate			
Stanines		1,2,3	4,5,6	7,8,9	Total (N)
Quality	1, 2, 3	15	34	17	66
	4, 5, 6	39	81	48	168
	7, 8, 9	19	37	8	64
	Total	73	152	73	298
$\chi^2 = 6.67$		df = 4	Sig. @ .20 > p > .10		

Rate

Table 3.1 shows a value for χ^2 of 6.67 when the test was applied for association between quality of handwriting and rate. The association was significant at the .20 level and probably significant at the .10 level. As the accepted level of significance was .05, it appears that on the basis of data in this study there is no tendency for the quality of handwriting to be affected by the rate of writing.

The stanine scores on Table 3.1 show fifteen of the samples of lowest quality and nineteen of the samples of highest quality written at the slowest rate, while thirty-nine of the samples of middle quality were written at this rate. Thirty-four of the samples written at middle rate were lowest in quality; eighty-one written at this rate were of middle

quality; while thirty-seven of highest quality ranked in the middle rate bracket. Of the samples written at highest rate, seventeen were of lowest quality, forty-eight of middle quality, and eight of highest quality. It would appear from this data that a difference in the rate of handwriting does not tend to affect the quality of handwriting at these grade levels.

The findings of research designed to test the effect of rate on quality are equally divided. Two researchers (Judd, 1916, cited in Monroe, 1917, p. 183; and Wheat, 1931, p. 272) indicate that increase in rate causes the quality of handwriting to suffer. These observations were made concerning grades five through eight. Other investigators (Thorndike, 1910, quoted in Monroe, p. 183; and DeVoss and Kelly, also quoted in Monroe) did not concur, for they were of the opinion that slowing down the rate did not improve the quality.

TABLE 3.2.

CONTINGENCY TABLE OF STANINES FOR QUALITY OF HANDWRITING
AND TYPE OF SCHOOL

Type of School	Stanines			Total (N)
	1,2,3	4,5,6	7,8,9	
A	0	7	5	12
B	8	24	10	42
C	17	39	16	72
D	28	48	15	91
E	13	50	18	81
Total	66	168	64	298

$$\chi^2 = 8.499$$

$$df = 8 \quad \text{Sig. @ } .50 > p > .30$$

Type of School

Table 3.2 shows the value of χ^2 in the test applied for association between quality of handwriting and type of school to be 8.499. Significance appeared at the .50 level and probably at the .30 level. On the basis of the data in this study there does not appear to be any factor in the different types of schools which tends to affect quality of handwriting. From the stanines of Table 3.2 it would appear that levels of achievement are fairly evenly distributed for every type of school. Type D schools have a greater number of cases appearing in the lowest rank of quality but this category has the highest number of specimens in the sample, so the proportions are similar.

While the data shows the association between the quality of handwriting and the different types of schools, it does not indicate the standard, or the degree of perfection attained. It does seem to show, however, that there tends to be uniformity of attainment. This in turn would tend to indicate that throughout the schools there is a certain measure of adherence to the criteria established in Bulletin 3.

No research dealing with rate of handwriting and size of school was found with which to compare the present study.

TABLE 3.3.
CONTINGENCY TABLE OF STANINES FOR QUALITY OF HANDWRITING AND SEX

Sex	Stanines			Total (N)
	1,2,3	4,5,6	7,8,9	
M	51	92	20	163
F	15	76	44	135
Total	66	168	64	298
$\chi^2 = 26.743$				
df = 8				
Sig. @ $p < .01$				

Sex

Table 3.3 shows a value of 26.743 for χ^2 when the test for association was applied to quality and sex. This association was significant at the .01 level. There was a measure of bias in the sample drawn as twenty-eight more boys than girls were represented. Examination of the table suggests that there is a tendency for girls to score higher than boys for quality of handwriting. 6.7% of the samples which ranked in the ninth, eighth, and seventh stanines were written by boys, while 15% of those in the same rank were written by girls. Of those specimens ranking in the sixth, fifth, and fourth stanines, 31% were written by boys and 25% were written by girls. Boys wrote 17% of the samples which ranked in the third, second, and first stanines, while girls wrote 5% of those which were so ranked.

The data in this study would seem, therefore, to support the findings of those who claim that girls tend "to write a fairer hand than boys" (Gesell, 1906, pp. 394; Burt, 1922, p. 311).

TABLE 3.4.

CONTINGENCY TABLE OF STANINES FOR QUALITY OF HANDWRITING
AND GRADE

Grade	Stanines									Total (n)
	1	2	3	4	5	6	7	8	9	
IV	9	13	18	21	18	9	8	2		98
V	2	1	4	23	20	14	13	13	10	100
VI	1	7	11	11	21	31	11	6	1	100
Total	12	21	33	55	59	54	32	21	11	298

$$\chi^2 = 87.306 \quad df = 16 \quad \text{Sig. @ } p < .01$$

Grade

Table 3.4 shows a χ^2 of 87.306 and significance at the .01 level for association of quality of handwriting and grade. This warrants acceptance of the hypothesis that there is a significant difference between quality of handwriting and grade.

Examination of Table 3.4 reveals that eighty per cent of the Grade Four specimens, fifty per cent of the Grade Five specimens, and fifty-one per cent of those from Grade Six ranked in the fifth or lower stanines. Approximately twenty per cent, fifty per cent, and forty-nine per cent of the Grade Four, Grade Five, and Grade Six specimens, respectively, ranked in the sixth and higher stanines. When examined in relation to the percentage of all the samples analysed, there were 6% of Grade Four samples, 17% of Grade Five samples, and 16% of Grade Six samples which ranked in the sixth and higher stanines.

This data seem to indicate that there is a tendency for Grade Five and Grade Six to write with a quality exceeding that of Grade Four, and that Grade Six appears to have a tendency to achieve at a slightly lower level than Grade Five. While this seems to be true on the basis of the data in this sample, the very size of the sample would not warrant the generalization that the quality of Grade Six handwriting is always less than that of Grade Five in the schools of this province.

The standards for quality shown on The Thorndike Scale for Handwriting of Children, Ayres Measuring Scale for Handwriting, and The American Handwriting Scale indicate that an increase in quality grade by grade should be expected. Brueckner and Bond (Brueckner and Bond, 1955, p. 385) concur by stating that "at this stage speed and quality both

tend to increase, the latter only slightly."

TABLE 3.5.

CONTINGENCY TABLE OF STANINES FOR QUALITY OF HANDWRITING
AND AGE

Age	Stanines			Total (N)
	1,2,3	4,5,6	7,8,9	
8 - 9	21	29	11	61
10	20	46	24	90
11	15	63	21	99
12	9	24	6	39
13,14,15	1	6	2	9
Total	66	168	64	298
$\chi^2 = 12.044$ $df = 8$ $Sig. @ .20 > p > .10$				

Age

Table 3.5 shows a χ^2 of 12.044, significant at the .20 level, and probable significance at the .10 level for association between quality of handwriting and age. These values do not warrant acceptance of the hypothesis that there will be a tendency for age to affect the quality of handwriting.

Examination of the data from Table 3.5 seems to indicate that there is no tendency for increase in quality to be maintained as the child matures, although there appears to be a peak of achievement at age ten

which is fairly well maintained at age eleven, and from that age there seems to be a tendency for lower levels of achievement. Of the samples ranking highest in quality, 4%, 8%, 7%, 2%, and .60% were written by ages eight and nine, ten, eleven, twelve, and by the thirteen, fourteen, fifteen age group, respectively. Of the samples which ranked in middle quality, 9.7%, 15%, 21%, 8%, and 2% were written by these groups in that order. Of those whose samples ranked lowest in quality, 7%, 7%, 5%, 3%, and .30% were written in that order by the same groups.

The available literature dealing with quality of handwriting does not contain studies which reveal the quality of handwriting at various age levels. The findings of the present study, therefore, cannot be compared with others.

TABLE 3.6.

CONTINGENCY TABLE OF STANINES FOR QUALITY OF HANDWRITING
AND TYPE OF PEN USED

Pen Type	Stanines			Total (N)
	1,2,3	4,5,6	7,8,9	
Straight	8	6	4	18
Fountain	21	51	23	95
Ballpoint	37	111	37	185
Total	66	168	64	298

$$\chi^2 = 7.406 \quad df = 4 \quad \text{Sig. @ } .20 > p > .10$$

Type of Pen Used

Application of the test for association between quality of handwriting and type of pen used shows χ^2 is 7.406, significance at the .20 level and probably significance at the .10 level. On the basis of these values, we may assume that there appears to be no tendency for quality of handwriting to be affected by the type of pen used.

Table 3.6 shows that there is considerable bias in the sample as only 6% of the specimens were written with a straight pen; over five times this number of samples were written with a fountain pen; and the total which were written with a ball point pen outnumbered those written with a fountain pen almost two to one, and those written with a straight pen more than ten to one. While this tends to reveal pen preference it gives no indication of the relative performance of the three types of pen used. Examination of the stanines shows the following: of the samples ranking lowest in quality, almost 3% were written with a straight pen, 7% with a fountain pen, and 12% with a ball point pen. Of the samples ranking highest, only some 2% were written with a straight pen compared to approximately 8% with a fountain pen, and slightly over 12% with a ball point pen. Samples of the middle ranks contained 2% written with a straight pen, 17% written with a fountain pen, and 37% written with a ball point pen.

The efficiency of different types of pen in Grades Four, Five, and Six has been the subject of very few studies. Whittaker (Unpublished Master's Thesis, University of Southern California, 1934, quoted in Herrick, 1960, p. 254) found that fountain pens produced writing of

higher quality than did steel pens. The relative efficiency of ball point pens does not appear to have been established.

TABLE 3.7.

CONTINGENCY TABLE OF STANINES FOR QUALITY OF HANDWRITING
AND HANDEDNESS

Handedness	Stanines			Total (N)
	1,2,3	4,5,6	7,8,9	
Right	61	154	57	272
Left	5	10	7	22
Total	66	164	64	294
$\chi^2 = 1.557$ $df = 2$ $\text{Sig. @ } .50 > p > .30$				

Handedness

Table 3.7 shows a value of χ^2 of 1.557, significance at the .50 level and probable significance at the .30 level. There appears, therefore, to be no basis for assuming from this study that handedness has a tendency to affect the quality of handwriting.

As will be seen in Table 3.7, slightly more than 7% of the samples were written by left-handed pupils. This figure compares favorably with the proportion of left-handed pupils found in a normal distribution of the population (Bulletin 3, p. 12); however, the fact that the left-handed group in this study is very small must be kept in mind when an assessment is made of the relative quality of the handwriting of left-

and right-handed writers.

An examination of the stanines shows 22% of the samples written by right-handed pupils are in the lowest rank, 56% are in the middle rank, and 21% are in the highest rank. Nearly 22% of the samples written by left-handed pupils are in the lowest rank, 45% are in the middle rank, and approximately 32% are in the highest rank. This data would seem to indicate that approximately the same proportions of samples of right-handed and left-handed pupils in Grades Four, Five, and Six tend to fall in each of the ranks of quality.

These results concur with the findings of Clark (Clark, 1957, p.197) which indicated that there was no tendency for left-handers to be poorer writers than right-handers. Beeley (quoted in Gray, 1938, p.121) found that the left-handed children in his study, too, wrote a quality that was not significantly poorer than that of the right-handed children. However, the results cited here are contradictory to those of Guilford (Guilford, 1936, p. 39) who found that the quality of handwriting of left-handed children was not on a par with that of right-handed children.

TABLE 3.8.

CONTINGENCY TABLE OF STANINES FOR QUALITY OF HANDWRITING
AND INTELLIGENCE

Intelligence Quotient	Stanines			Total (N)
	1,2,3	4,5,6	7,8,9	
60-99	16	33	9	58
100-119	38	104	40	182
120-149	12	31	15	58
Total	66	168	64	298

$\chi^2 = 2.588$ $df = 4$ $\text{Sig. @ } .70 > p > .50$

Intelligence

The test for association applied to quality of handwriting and intelligence shows χ^2 is 2.588, significance at the .70 level and probable significance at the .50 level. On the basis of this study it would appear, therefore, that there is no tendency for intelligence to affect the quality of handwriting.

Table 3.8 shows that the number of specimens ranking lowest in value is slightly more in the lower than in the upper range of intelligence quotient represented in the samples. The number of samples of medium quality in both the upper and lower ranges was approximately equal. The greatest number of specimens of highest rank was written by the group in the upper range of intelligence. However, in each case the number was not significant.

Research has failed to establish the relationship between quality of handwriting and intelligence. The findings of the present study parallel those of Gates and LaSalle (Gates and LaSalle, 1924, pp. 205-216) who said that writing ability is correlated slightly, if at all, with intelligence. On the other hand, Gesell (Gesell, 1906, pp. 394-404, quoted in Gray, 1938, p. 112) concluded that there is a tendency for accuracy in handwriting to vary directly with school intelligence. Terman (Terman, 1926, quoted in Schonell, 1948, p. 90) found that children with I.Q. over 130 were weakest in subjects requiring manual dexterity, such as handwriting.

Summary of Quality of Handwriting and Eight Variables

Table 3 has been concerned with data dealing with the association between quality of handwriting and rate, type of school, sex, grade, age, type of pen used, handedness, and intelligence. On the basis of this study, the two variables, sex and grade, appear to have a tendency to affect the quality of handwriting. Those variables which seemed to have no tendency to affect quality of handwriting were rate of writing, type of school, age, type of pen used, handedness, and intelligence.

FREQUENCY OF MALFORMATION OF LETTERS IN GRADE FOUR, GRADE FIVE
AND GRADE SIX

Grade	FOUR	FIVE	SIX	GRADES FOUR, FIVE, and SIX COMBINED	
	Letter Freq- uency	Letter Freq- uency	Letter Freq- uency	Letter	Freq- uency
	h 86	h 81	h 88	h	255
	r 86	o 79	s 79	o	224
	d 79	s 67	d 76	s	224
	s 78	g 66	r 75	r	221
	g 72	a 62	o 75	d	213
	t 71	n 60	e 74	g	198
	o 70	r 60	m 68	t	190
	a 65	t 59	n 66	a	184
	e 58	d 58	g 60	n	180
	T 57	m 56	t 60	m	179
	m 55	k 48	a 57	e	178
	f 54	e 46	T 49	T	149
	p 54	T 43	f 48	f	144
	n 54	f 42	p 47	p	141
	k 47	p 40	b 45	k	138
	l 35	b 33	k 43	b	112
	b 34	w 26	w 29	w	80
	w 25	c 17	l 26	l	78
	i 18	l 17	i 18	i	50
	u 10	i 14	c 12	c	35
	c 6	u 8	u 10	u	28
Total	1114	982	1105		3201

ANALYSIS OF MALFORMATION OF LETTERS

One of the purposes of this study was to compare the quality of handwriting of pupils in grades four, five, and six. In order to determine the quality, an assessment was made of the number of malformations of letters. This was done by recording the malformation made by each of these three grades in the one hundred samples of the separate grades drawn for complete analysis.

Table 4 shows that there were 1114 malformations of letters in Grade Four; those of Grade Five, were 982; while 1105 occurred in Grade Six. Thus the total number of malformations in Grade Five writing was a substantial decline from those of Grade Four, but on the other hand, the malformations made by Grade Six almost equalled those of Grade Four.

The most troublesome letter in all three grades seemed to be 'h', as it was written incorrectly on eighty-six, eighty-one, and eighty-eight samples in Grades Four, Five, and Six, respectively. The most common errors in Grade Four were 'h', 'r', 'd', 's', 'g', and 't'; in Grade Five they were 'h', 'o', 's', 'g', 'a', and 'n'; and in Grade Six, 'h' again was most frequently written incorrectly with 's', 'd', 'r', 'o', and 'e' following in that order.

In the three grades combined, the letters which caused the most trouble and which accounted for over 47% of all malformations were 'h', 'o', 's', 'r', 'd', 'g', and 't'.

Pressey (Pressey and Pressey, 1927, pp. 270-273) found the most troublesome letter to be 'r', and that over half of all illegibilities were caused by 'r'. 'n', 'e', 'a', 'o', 's', and 't'. Newland (Newland, 1932, pp. 249-258) revealed that four letters, 'a', 'e', 'r', and 't'

account for approximately half of all illegibilities. These two studies thus found four letters in common which were the cause of illegibilities.

While the present study concerns malformation of letters rather than illegibility, it indicates that pupils continue to have trouble with the letter 'r', and that the letters 'o', 'e', 's', and 't' appear to contribute to difficulties with regard to formation of letters, as well as to illegibilities.

SUMMARY OF CHAPTER

This chapter has dealt with three aspects of handwriting: 1) the association between rate of handwriting and seven variables, type of school, sex, grade, age, type of pen used, handedness, and intelligence; 2) quality of handwriting and eight variables, rate, type of school, sex, grade, age, type of pen used, handedness, and intelligence; and 3) the analysis of malformation of letters.

On the basis of the specimens of handwriting received from grade four, five, and six pupils in the Province of Alberta, an analysis of the data reveals that sex, handedness, and intelligence have no tendency to affect the rate of handwriting, while the type of school, grade, age, and type of pen used tend to affect the rate. An examination of the data pertaining to quality of handwriting reveals that there is a tendency for sex and grade to affect this quality, while none of the variables, rate, type of school, age, type of pen used, handedness, or intelligence appears to affect quality.

In three hundred specimens of handwriting analysed for malformation of letters, there were 3201 malformations. The letter 'h' was incorrectly formed in over 80% of the samples, while the additional letters 'o', 's', 'r', 'd', 'g', and 't' accounted for almost one-half of all malformations.

CHAPTER V

CONCLUSIONS, IMPLICATIONS, AND RECOMMENDATIONS

This study has been concerned with the handwriting of Grade Four, Grade Five, and Grade Six pupils in certain schools in the Province of Alberta. It has attempted to test the association between rate of handwriting and seven variables, namely, type of school, sex, grade, age, type of pen used, handedness, and intelligence. It has also inquired into the relationship between quality of handwriting and eight variables. These were rate of handwriting, type of school, sex, grade, age, type of pen used, handedness, and intelligence. In addition, an analysis was made of the malformation of letters in the three grades.

The conclusions reached on the basis of the data, together with comments of the investigator, will be presented as they relate to each of the hypotheses.

HYPOTHESIS I

Rate of Handwriting

- a. There will be no significant difference between the rate of handwriting and the size of the school.

The present study presents data which shows that there is a tendency for rate of handwriting to vary with the type of school. In the A category schools the percentage of pupils who wrote at the fastest rate was much greater than that of any of the other four categories, and there were no pupils of A category schools who wrote at the slowest rate. Furthermore, as the size of the school increased the percentage of pupils writing at

lower rates also tended to increase.

It would seem, therefore, that in this study the rate of children's writing tends to be affected by the size of the school.

It is possible that pupils in smaller schools tend to develop a faster rate of handwriting through participation in independent activities which involve the writing act. For example, these pupils may have had to do a great amount of seatwork and as a consequence developed greater speed. They may also have used pen and ink independently and so had a certain facility with the instrument which was not permissible in classrooms where pupils were under constant direction. The answer might lie, too, in the restrictions placed on the use of a pen in certain schools, which in turn may have tended to influence the results. The rate might tend to be affected by the movement employed, too, for it is claimed that arm movement is difficult to acquire (Gray, 1956, p. 197), so that any pupils who were required to use arm movement alone, might tend to write slowly. One might consider, as well, the possibility that these pupils in the smaller schools lived in areas in which the demands on their time were less than in highly organized centres where many activities were undertaken. The former children may have used some type of writing activity as amusement, which in turn could affect the rate of handwriting.

Again, the restrictive use of a certain type of pen in certain schools may have affected the rate, as this study indicates that there is an apparent tendency for type of pen to affect rate.

- b. There will be no significant relationship between the rate of handwriting and the sex of the writer.

The evidence obtained from this study supports this hypothesis.

While the percentage of boys who wrote fastest was slightly less than that of girls who wrote at this rate, and the percentage of boys who wrote at the slowest rate was greater than that of girls who wrote slowest, neither of these numbers was sufficiently high to be significant.

The present study, therefore, tends to refute the conclusions of Burt (Burt, 1922, p. 311) who found that girls write faster at every age than boys.

Perhaps in the forty years that have elapsed since Burt's conclusions, motivation and goals have changed sufficiently to bring about an equality in rate of writing between the sexes in these grades. In our schools we have almost an equal proportion of boys and girls in the grades sampled in this study, and the same standards of performance are set for both groups. It is not the girls alone who are studying and preparing for careers in which writing is a necessity, and so the emphasis throughout our schools is directed towards comparable performance of both boys and girls.

- c. There will be a significant difference between rate of handwriting and grade.

The present study tends to confirm the findings of previous research and expert opinion in this respect. Grade Six pupils revealed a tendency to write at the fastest rate, followed by Grade Five, and then by Grade Four. This concurs with the standards established by Thorndike, Ayres, and West in the construction of their handwriting scales in which they indicate a progressive increase in rate of writing in these three grades.

- d. There will be a significant difference between rate of handwriting and age of pupils.

The data with which this study was concerned indicate that there was a tendency for rate to increase with age from age eight through age eleven. At age twelve and over there were fewer children who wrote at the fastest rate; however, there were also fewer who wrote at the slowest rate. There was, therefore, a tendency to maintain, but not to increase, the rate beyond age eleven.

The tendency for rate of handwriting not to increase after age eleven might be due to several factors. The children age twelve and over in these grades might be those who were retarded for any one or more of several reasons. They might be repeating the grade and have become indifferent, or have physical defects or abnormalities of one kind or another which affected muscular control and thus hindered progress. Cole (Cole, 1941, p. 464) expressed the opinion that "speed of writing is a product of age and the need to write rapidly." She may have regarded age as a level of maturity at which period a child would have the muscular coordination and control necessary to the skill of writing. Interpreted in this sense it would seem that the peak of this maturity reached by the Grade Four, Five, and Six children in the present study tends to become evident at age eleven.

- e. There will be no significant relationship between rate of handwriting and the type of pen used.

On the basis of the findings of the present study this hypothesis

could not be supported. Over sixty per cent of the pupils who wrote with a straight pen performed at the slowest rates. The number exceeded by a substantial margin those who performed at this rate with either a fountain pen or a ball point pen. Of those who wrote fastest, the ball point users almost tripled those who used straight pens, while the number who used a fountain pen and wrote at the highest rate was more than double their straight pen counterparts.

Consideration of the operation of a straight pen would tend to lead one to expect that it could not produce at as high speeds as either a ball point pen or a fountain pen. Stopping to dip the nib in ink would require several seconds, during which time those who were using either a ball point pen or a fountain pen would be writing continuously. The possibility exists, too, that the point of a straight pen might pierce the paper, and so a writer working under the apprehension of such an occurrence, could very conceivably tend to slow down. This hazard would probably occur more frequently with a straight pen than with a fountain pen. With regard to the fountain pen, its size could be a factor in the relative rate of writing attained with that instrument, as a large pen which proved difficult to handle might in turn impede rate of writing. The type of nib could also be a factor which could tend to prevent efficient operation, as a scratchy or sharp point is not conducive to speed.

Apparently the ball point pen tended to be not only the most efficient instrument with regard to rate of writing, in the three grades sampled, but it seemed to be the most popular as well, for it was used by 58 per cent of the students compared to 35 per cent who

used a fountain pen, and 6 per cent who used a straight pen.

- f. There will be no significant difference between rate of handwriting and handedness.

The difficulties faced by left-handed writers of grades four, five, and six in this study do not appear to have resulted in lower rates of handwriting, for the findings indicate that there is no apparent tendency for handedness to affect the rate of writing.

In the past, and perhaps still today, many people have felt that writing presented many hazards for the left-hander. Twenty-five years ago research (Guilford, 1936, quoted in Herrick, 1960, p. 254) was still accumulating evidence which concluded that for fifth and sixth grade children at least, left-handedness was a handicap which seemingly precluded the probability of attaining either rate or quality of writing comparable to that achieved by a right-hander. Fortunately, this opinion was not entertained complacently, for as early as 1918 Beeley (Beeley, 1918, quoted in Gray, 1938, p. 121) declared that handedness, in grades two through eight, was not a factor which resulted in differences of rate of writing, and this was later confirmed with respect to children age eight to fourteen (Clark, 1957, p. 197; Smith and Reed, 1959, p. 75).

Vigorous programs which dealt with the left-handers' problems, both from a psychological and physical viewpoint, and the development of instructional methods geared to overcoming apparent deficiencies in the achievement of these children have possibly been factors in reducing any observed inequality where handedness was concerned.

This apparent tendency for left-handed writers to attain a rate of handwriting equal to that of right-handed writers speaks well for the instruction given, and the care exercised, by teachers who have

left-handed pupils in the classroom. With continued vigilance to the best methods of instruction and with increased perfection of writing instruments, any degree of difference between the rate of left-handed and right-handed writers should disappear.

- g. There will be no significant relationship between rate of handwriting and intelligence.

The present investigation supports the hypothesis that, with respect to those pupils in grades four, five, and six whose handwriting was analysed, there is no tendency for intelligence to affect the rate of writing. Previous studies of this nature have been concerned mainly with determining the relationship between quality of handwriting and intelligence. In view of this fact, the conclusion reached, on the basis of this study, cannot be confirmed or refuted.

Writing is a skill which depends to a large extent on muscular control; indeed, it has been estimated that the writing act involves some five hundred muscles. It would seem, therefore, that such an involved process could very well hinge on factors other than intelligence, such as, for example, maturation and interest. This last named factor is probably one of the keys to perfecting the handwriting skill, for people usually do best, and will strive to overcome imperfections in, that which interests them.

HYPOTHESIS II

Quality of Handwriting

- a. There will be a significant relationship between quality of handwriting and rate of writing.

The present study does not support the hypothesis that there will

be a significant relationship between quality of handwriting and rate of writing. In this respect it tends to confirm the findings of Thorndike (quoted in Monroe, 1917, p. 183), DeVoss and Kelly (quoted in Monroe, 1917, p. 183) from a study of handwriting in grades two to eight that slowing down the rate did not improve the quality. Their findings were in conflict with those of Judd (1916, quoted in Monroe, 1917, p. 183) who reported the results of his survey of handwriting of grades five to eight of a large city school. In reviewing Judd's conclusions, Wheat (Wheat, 1931, p. 272) agrees with him that "greater speed seems to be purchased at an undue sacrifice of quality, and higher quality seems to result in much slower speeds."

Cole (Cole, 1938, p. 614) claims that it is not speed and quality, but hurrying and quality, that are related. For example, if a child does not observe the correct formation of letters, the rate at which he writes the letters will have no bearing on the quality of his writing. By the same token, if he lacks muscular coordination, a change in rate may have no affect on quality.

The present investigation appears to indicate that the quality of handwriting of the three grades sampled tends to be affected by a factor or factors other than rate.

- b. There will be no significant difference between quality of handwriting and size of school.

No research was reviewed which indicated if there is any significant difference in the quality of handwriting of pupils in schools of varying size. This study, then, in presenting evidence to support the hypothesis, must rest on the interpretation of the data.

It would seem that the different types of schools sampled tend to maintain the same level of achievement with regard to quality of handwriting, for there appears to be no significant difference in the relative performance of the pupils of each type of school sampled in this study.

That this is so would tend to indicate that the program of instruction for grades four, five, and six in this province is based to a large extent on Bulletin 3, as the criteria set forth in that publication formed the basis for judging the quality of handwriting in this study.

- c. There will be no significant relationship between quality of handwriting and the sex of the writer.

This hypothesis is substantiated by the findings secured in the present study and, with respect to grades four, five, and six pupils in this province, confirms the findings of Gesell (Gesell, 1906, pp. 394-404) and Burt (Burt, 1922, p. 311).

That the girls in this study display a tendency to "write a fairer hand than boys" seems rather interesting in view of the fact that the same boys had a tendency to write at a rate which equalled that of the girls. The explanation might lie in the purpose for which writing is done. For example, the pupils may all have had to reach certain goals in amount of written work, in which the kind of writing done was immaterial. In that case all the pupils would tend to write at a uniform rate. However, when quality of handwriting was the goal, they may not have been interested in, nor capable of, producing writing that was equal in quality to that of the girls.

- d. There will be a significant difference between quality of handwriting and grade.

The findings from the present study support the above hypothesis.

On the basis of the data observed it would appear that Grade Five and Grade Six pupils have a tendency to write with a quality which exceeds that of Grade Four, but that the quality of the writing of Grade Six pupils appears to be slightly lower than that of Grade Five.

Several reasons may contribute to the apparent decrease in quality of the handwriting of the Grade Six pupils under study. These children probably use writing to a greater degree in the content fields and are more concerned with factors of writing other than those which affect quality. The press of work in other subjects with the accompanying increased demands for writing at this stage might also tend to lead to less diagnostic and remedial work in handwriting in this grade. Thus errors could be maintained rather than eliminated. An instructor and observer (Cole, 1941, p. 467) who has done much work in this area says that general practice merely teaches pupils to make their malformed letters more neatly and more rapidly from one grade to the next, because, after all, children write for the purpose of conveying ideas. This is also a stage at which the children are accumulating large amounts of material which they are themselves recording, and it is the quantity of writing which is important, rather than the quality.

- e. There will be a significant relationship between quality of handwriting and age.

The relationship between quality of handwriting and specific ages was not revealed by related research. The handwriting scales available

and comments regarding quality are directed mainly to grade groups.

For this reason, in offering data which appears to reject the hypothesis that there will be a significant relationship between quality of handwriting and age, this study can neither be upheld nor denied by previous research.

The study presents data which seems to indicate that for the grades tested there is no tendency for increase in quality to be maintained year by year. There does appear to be a peak of achievement at age ten, which is fairly well maintained at age eleven. From that age, in this study, the level of achievement decreases.

The tendency for the twelve-to-fifteen-age group to achieve at lower levels might be attributed to the growth process. At this age children are undergoing great physiological changes and, as a consequence, muscular coordination is somewhat erratic. Hildreth (Hildreth, 1947, p. 585) believes that, apart from errors due to malformations, a child's individual growth tendencies set limitations on the quality of the written product. This group, too, might contain some under-achievers, or possibly children with physical or emotional disabilities which might tend to affect the quality of their handwriting. The same factors, such as goals and interests, which tend to affect rate of handwriting, might be worthy of consideration here as well.

As for the eight- and nine-year-old group, at this stage they have not perfected the skills involved in the handwriting act which depends on muscular control, and thus a level of achievement lower than that of pupils age ten or eleven might be expected.

- f. There will be no significant relationship between quality of handwriting and the type of pen used.

Evidence supplied by the data supports this hypothesis, and so on the basis of this study it appears that, for those pupils concerned, the type of pen used had no tendency to affect the quality of handwriting. Despite the fears of critics of the ball point pen and proponents of the straight pen, it would seem, for the group sampled at least, that type of pen used could remain a matter of choice if quality of handwriting were the only consideration. If a child reaches a relative degree of achievement in handwriting regardless of the instrument used, it would manifestly be folly to place restrictions on the choice of pen. This point would seem to be of vital importance inasmuch as the present study indicates that the rate of handwriting of the children concerned tended to be affected by the type of pen used. If one pen seems to give equal results in quality to another, then it might be wise to consider using the pen which is conducive to the fastest rate.

- g. There will be no significant difference between quality of handwriting and handedness.

There is evidence from this study which shows that there is no tendency for handedness to affect the quality of handwriting in the grade four, five, and six pupils sampled. Although opinion and research in the past (Guilford, 1936, p. 39; quoted in Herrick, 1960, p. 254) indicated that left-handed writers wrote with a quality inferior to that of right-handers, observers within the last decade or two began to doubt such a stand, and subsequent studies (Clark, 1957, p. 197; Smith and Reed, 1959, p. 75) tend to reveal equality of achievement between the two groups. The conclusions of these studies may be compared with the

present investigation for Guilford observed fifth and sixth grade children, Clark studied children from five to twelve years of age, while Smith and Reed tested pupils from eight to fourteen years old.

Teachers and supervisors must be gratified to note that efforts to maintain standards of quality of left-handed writers on a par with those of right-handers appear to have met with success.

- h. There will be no significant relationship between quality of handwriting and intelligence.

The findings of this study support the hypothesis and confirm the research of Gates and LaSalle (Gates and LaSalle, 1924, pp. 205-206, quoted in Gray, 1938, p. 111); and Terman (Terman, 1926, quoted in Schnell, 1948, p. 90) that intelligence appears to have no tendency to affect the quality of handwriting. Gates and LaSalle dealt with pupils in grades one to nine, while Terman studied those with I.Q. 130 or over.







In the present study there were slightly more specimens of handwriting ranking lowest in quality written by those in the lower range of intelligence; however, the number was not significant. Nor was the number of specimens of highest rank written by the group in the upper range of intelligence significant.

It would appear then, that for the grades tested in this study, the quality of handwriting tends to be affected by a factor or factors other than intelligence.

Malformation of Letters

The final phase of the study concerned an analysis of malformations

of letters. Similar studies (Pressey and Pressey, 1927, pp. 270-273; Newland, 1932, pp. 249-258) had judged handwriting of children from grade one through high school and found that the greatest number of errors in the samples investigated was due to irregularities in the form of a few letters. In this study, the letter incorrectly formed most frequently was 'h', as it was the most troublesome letter for all three grades, separately and grouped. The letters 'o', 's', 'r', 'd', 'g', and 't' combined with 'h' to total almost one-half of all malformations. It is interesting to note that the study revealed a tendency for Grade Six to write almost as many letters incorrectly as did Grade Four, while the malformation of letters on the Grade Five specimens was almost twelve per cent less than those of Grade Six.

The letter forms of Bulletin 3, page 11, were used as the criteria for establishing malformations of letters, and any departure from these forms was judged to be an error. The investigator noted that many of the malformations were what might be termed a simplified, or a more utilitarian form. For example, Bulletin 3 shows the letter 'g' in this form: , whereas a great many students wrote the letter thus: . Many of the difficulties with the letter 'r' stemmed from carrying the initial stroke far beyond that of the prescribed form, as  rather than . The letter 'b' was frequently written with a straight stroke back to the base line, , rather than with a curve, , as shown in Bulletin 3. These forms may have been developed by the pupils because they were most useful when speed and ease of writing were considered. The investigator felt that these writers seemed to have developed the writing act

to the point where they no longer tended to draw the letter, or even to copy it, but had launched into a form which was not so much an error as a utilitarian expediency, or what might be termed "functional application by children in meeting their own needs" (Harding, 1951, p. 7).

Summary of Conclusions

The conclusions drawn from the study may be summarised as follows:

1. there was a tendency for rate of writing to be affected by the type of school, grade, age, and type of pen used; rate did not appear to be affected by sex or handedness;
2. neither rate, type of school, age, type of pen, handedness, nor intelligence tended to affect quality, while the two variables, sex and grade, appeared to have a tendency to affect the quality;
3. certain letters appear to give the most trouble to Grade Four, Five, and Six pupils; these were the letters 'h', 'o', 's', 'r', 't', 'd', and 'g', with 'h' showing the greatest number of irregularities.

LIMITATIONS OF THE STUDY

The conclusions drawn from the study may not be considered definitive, nor was the study exhaustive in its scope by reason of certain limitations.

1. The study was limited by grade and province inasmuch as it dealt only with the handwriting of Grade Four, Grade Five, and Grade Six pupils in selected schools in the Province of Alberta.

2. The proportion of one-room schools from which samples were received was small, consequently the samples received from these schools would be numerically smaller and the data would not be as representative.
3. The validity and reliability of the actual writing test would depend upon: (a) the memorization of the selection to be written, (b) the condition of the writing instrument, (c) the strict adherence by the teacher to the two-minute time limit.
4. Some of the Intelligence Quotient data may not have been reliable. Some pupils may have had no intelligence test since Grade One, and intelligence tests at this age are unreliable. Again, it is probable that different intelligence tests were used; some may have been entirely verbal while others may have included a non-verbal score.
5. An attempt was made to have the analysis of the specimens for quality of handwriting as objective as possible by having experienced, qualified teachers do the analysis; however, the subjective nature of the evaluation may have influenced the results.
6. Bulletin 3, Program of Studies for the Elementary School was used as the criteria for judging formation of letters and other characteristics of quality. Another type of letter formation may have had different results but since Bulletin 3 contains the curriculum for handwriting it was used in the study.
7. Neuromuscular disabilities of the pupils may have tended to influence the rate and quality of handwriting of some of the pupils. No indication of this was given by the teachers.

8. No evidence was obtained from the teachers as to the amount of time devoted weekly to handwriting. The suggestions in Bulletin 3 relative to instruction may not hold, and in fact many teachers in Grade Six may not be teaching handwriting continuously.
9. Obtaining the samples of handwriting had to be left to the individual teachers of the chosen classrooms as the investigator could not do this personally. Certain directions for conducting the actual writing test were given to the teachers and it was assumed that these directions would be followed.
10. It was further assumed that the actual writing test would not be done after major muscular activity had taken place. The quality and rate of writing of any pupils who wrote after strenuous exercise may have been affected.

The conclusions drawn from the findings of this study lead to suggestions and recommendations, and also reveal certain areas in which research might prove of value.

Recommendations

1. Bulletin 3, Program of Studies for the Elementary School was issued in 1950. A revision of this bulletin would seem to be advisable at this time in the light of three things:
 - a. present day experience makes some of the material out of date; for example, the widespread acceptance of the ball point pen, its obvious preference by pupils, and its relative high performance as evidenced by this study would seem to indicate that direction should be given to

teachers regarding this instrument;

- b. the script form shown in Bulletin 3 could be replaced with one which would remove inconsistencies in letter formation; for example, it is suggested in Bulletin 3 that the letters 'l', 'h', 'b', and 'k' be grouped because of the kind of movement made in their formation (p. 9). However, probably because an artist drew the letters, the loops of 'b' and 'l' are shown rounded, *b, l*, while 'h' is shown with a straight stroke, *h*.

There is no need, either, for bringing the return stroke of the letter 'q' through the lower stroke *q*;

- c. in view of the interest shown in Europe and more recently on this continent for Italic script, some appraisal of its worth might be given in Bulletin 3 together with provision for its introduction into our schools.

2. In view of the fact that this study shows that there tends to be a breakdown in quality of handwriting at the Grade Six level, attention could be directed towards preventing such a breakdown by an effort to improve the quality. Consideration of the number of malformations of letters, particularly in Grade Six, tends to indicate that improvement of quality might begin with diagnostic and remedial measures designed to improve formation of letters. It may be that at this level there is not as much time devoted to the teaching of handwriting as there

is at other levels. Provision should, in that case, be made for definite periods of instruction in handwriting.

Suggestions For Further Research

1. As the present study has attempted to reveal only the association between rate and quality of handwriting and certain variables, and the frequency of malformations of letters, a study is recommended to prepare a handwriting scale which could be used in the classroom to compare pupils' handwriting with that of other children in Alberta.

2. A comparative study is recommended which would determine to what extent quality of handwriting is affected by letter formations, spacing, slant, size, alignment, and quality of line.

3. A study in which the handwriting of matched pairs of left- and right-handed children was observed is recommended to provide more data for comparison of the achievement of these two groups.

4. The data of the present study could be used as the basis of further research to establish the norms based on the average or median rate of handwriting of grades four, five, and six.

5. A similar study could be undertaken which would include pupils of earlier and later grades.

6. A study which will survey handwriting practices in the schools of the province is recommended.

Concluding Statement

Since there has been so little recent published research on handwriting, and none such originating in this province, there would seem

to be a need for regular studies by which handwriting in the schools may be continuously evaluated and appraised.

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1. The first part of the paper discusses the importance of maintaining accurate records of all transactions. It emphasizes that this is essential for the proper management of the company's finances and for ensuring that all stakeholders are kept informed of the company's financial health.

2. The second part of the paper discusses the importance of maintaining accurate records of all transactions. It emphasizes that this is essential for the proper management of the company's finances and for ensuring that all stakeholders are kept informed of the company's financial health.

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4. The fourth part of the paper discusses the importance of maintaining accurate records of all transactions. It emphasizes that this is essential for the proper management of the company's finances and for ensuring that all stakeholders are kept informed of the company's financial health.

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6. The sixth part of the paper discusses the importance of maintaining accurate records of all transactions. It emphasizes that this is essential for the proper management of the company's finances and for ensuring that all stakeholders are kept informed of the company's financial health.

7. The seventh part of the paper discusses the importance of maintaining accurate records of all transactions. It emphasizes that this is essential for the proper management of the company's finances and for ensuring that all stakeholders are kept informed of the company's financial health.

8. The eighth part of the paper discusses the importance of maintaining accurate records of all transactions. It emphasizes that this is essential for the proper management of the company's finances and for ensuring that all stakeholders are kept informed of the company's financial health.

9. The ninth part of the paper discusses the importance of maintaining accurate records of all transactions. It emphasizes that this is essential for the proper management of the company's finances and for ensuring that all stakeholders are kept informed of the company's financial health.

10. The tenth part of the paper discusses the importance of maintaining accurate records of all transactions. It emphasizes that this is essential for the proper management of the company's finances and for ensuring that all stakeholders are kept informed of the company's financial health.

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10. The first of these is the
fact that the system of
the world is not a simple
one, but a complex one.

A P P E N D I X

APPENDIX A

LETTER TO SUPERINTENDENT

1912
 March 1st
 Superintendent

In answer to your letter of the 28th inst. regarding the proposed change in the location of the school building, I am glad to hear that the Board of Education has decided to build a new building on the corner of 1st and 2nd streets, and I am sure that the new building will be a great improvement on the old one.

I am glad to hear that the Board of Education has decided to build a new building on the corner of 1st and 2nd streets, and I am sure that the new building will be a great improvement on the old one.

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Very respectfully,
 J. H. [Name]

1912

THE
HISTORY OF THE
CITY OF BOSTON

The history of the city of Boston is a subject of great interest and importance. It is a city of many centuries, and its history is full of interesting events and incidents. The city was founded in 1630, and has since that time been a center of commerce and industry. It has been the seat of many important events, and has played a large part in the history of the United States. The city is now one of the most important cities in the world, and its history is a subject of great interest to all who are interested in the history of the United States.

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APPENDIX B FORM TO SUPERINTENDENT

How Many Members

Number of persons in the club who are full members of the club

Number of persons in the club who are full members of the club

5 - 10

Name of person

Address

Address

Phone

Phone

Address

Address

Phone

Address

Phone

Address

Phone

Address

11 - 15

Name of person

Address

Address

Phone

Phone

Address

Address

Phone

Address

Phone

Address

16 - 20

Name of person

Address

Address

APPENDIX D

LETTER TO TEACHERS

Dear

I am writing to you today to tell you about the new program that we are starting in our school. This program is called "The New Program" and it is a very important part of our school. We are going to start this program in the fall and we need your help to make it a success. We are going to have a meeting with you on the 15th of September at 7:00 PM. We will be talking about the program and how we can work together to make it a success. We will be talking about the program and how we can work together to make it a success. We will be talking about the program and how we can work together to make it a success.

We are going to have a meeting with you on the 15th of September at 7:00 PM. We will be talking about the program and how we can work together to make it a success. We will be talking about the program and how we can work together to make it a success. We will be talking about the program and how we can work together to make it a success. We will be talking about the program and how we can work together to make it a success. We will be talking about the program and how we can work together to make it a success. We will be talking about the program and how we can work together to make it a success. We will be talking about the program and how we can work together to make it a success.

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Yours truly,

John Doe

THE FUTURE OF THE WORLD



APPENDIX E
FORM TO TEACHERS

Dear fellow teacher,

I request to take part in the _____ survey. ☐ Yes ☐ No

Name of school _____

Number of years teaching _____

Number of pupils in the school _____

☐

Class 1

☐

Class 2

☐

Class 3

(Signature)

APPENDIX F

SELECTION CHOSEN FOR COPY

THE HISTORY OF THE
CITY OF BOSTON

THE HISTORY OF THE
CITY OF BOSTON
FROM THE FIRST SETTLEMENT
TO THE PRESENT TIME
BY
JOHN HUTCHINGS
OF THE BARRISTER AT LAW
IN THE COURT OF COMMONS
IN PARLIAMENT ASSEMBLED
AND
OF THE BARRISTER AT LAW
IN THE COURT OF COMMONS
IN PARLIAMENT ASSEMBLED
LONDON
PRINTED BY J. DODD, ST. MARTIN'S LANE
1791

APPENDIX G INSTRUCTIONS TO TEACHERS PRIOR TO TEST

Box 915
Frisco, Texas
February 10, 1962

Dear _____

Thank you for your willingness to accept the role of being an "observer" in the study. I am sure that you will find this an interesting and useful experience.

There are a few things I would like you to do:

1. When you observe a teacher in the classroom, please do not make any attempt to influence the teacher or the students in any way. Just observe and record what you see.

2. Please make a record of the teacher's behavior as you observe. This should include the teacher's verbal and non-verbal behavior, and the students' behavior.

3. Please make a record of the teacher's behavior as you observe. This should include the teacher's verbal and non-verbal behavior, and the students' behavior.

4. Please make a record of the teacher's behavior as you observe. This should include the teacher's verbal and non-verbal behavior, and the students' behavior.

Thank you for the information that I would like you to follow in observing the teacher and students. We are sure that you will find this an interesting and useful experience.

I am sure that you will find this an interesting and useful experience. We are sure that you will find this an interesting and useful experience.

Thank you very much for your cooperation and assistance.

Sincerely,

BOY **GIRL**

GRADE AGE

TYPE OF PEN USED:

Straight pen and nib

Fountain pen

Ball point pen

HANDEDNESS:

Right-handed

Left-handed

I.Q.

This image shows a single page of white paper with horizontal blue or grey ruling lines. The lines are evenly spaced and run across the width of the page. There is no handwriting or printed text on the page.

APPENDIX I

APPENDIX J

FORM 2000 FOR STATISTICAL ANALYSIS OF SURVEY DATA

Sample Number: _____

Notes: _____

Question Number	Response	Score	Weight	Total	Point
1. How often do you use this product?	1	10	75	10	5
2. How often do you use this product?	2	20	15	10	5
3. How often do you use this product?	3	30	20	5	3
4. How often do you use this product?	4	40	25	5	3
5. How often do you use this product?	5	50	30	4	2
6. How often do you use this product?	6	60	35	4	2

Total: _____

APPENDIX K

TABLE K-1. SUMMARY OF THE DATA FOR THE CALCULATION OF THE

CALCULATION

	1000	1000	1000	1000	1000
1000	1000	1000	1000	1000	1000
1000	1000	1000	1000	1000	1000
1000	1000	1000	1000	1000	1000
1000	1000	1000	1000	1000	1000
1000	1000	1000	1000	1000	1000

Table 1	
Year	Value
1980	100
1981	105
1982	110
1983	115
1984	120
1985	125
1986	130
1987	135
1988	140
1989	145
1990	150
1991	155
1992	160
1993	165
1994	170
1995	175
1996	180
1997	185
1998	190
1999	195
2000	200
2001	205
2002	210
2003	215
2004	220
2005	225
2006	230
2007	235
2008	240
2009	245
2010	250
2011	255
2012	260
2013	265
2014	270
2015	275
2016	280
2017	285
2018	290
2019	295
2020	300

APPENDIX I
GUIDE LINES FOR DETERMINING SLANT



SAMPLE OF BEST WRITING

BOY GIRL X.....GRADE V..... AGE 12.....

TYPE OF PEN USED:

Straight pen and nib X.....

Fountain pen

Ball point pen

HANDEDNESS:

Right-handedX.....

Left-handed

I.Q.85.....

Escape at Bedtime

170

The lights from the parlor and kitchen
shone out

Through the blinds and the windows
and bars,

And high overhead and all moving
about

There were thousands and millions
ons of stars

There ne'er were such thousands

APPENDIX N
SAMPLE OF AVERAGE WRITING

BOY ☒ GIRL ☐

GRADE 5 AGE 11

TYPE OF PEN USED:

Straight pen and nib ☐

Fountain pen ☐

Ball point pen ☒

HANDEDNESS:

Right-handed ☒

Left-handed ☐

I.Q. 100

AS-20

The lights from the parlor and kitchen
shone out
Through the blinds and the window and
bars
And high overhead

APPENDIX O

SAMPLE OF POOREST WRITING

BOY GIRL 2GRADE 5 AGE 11

TYPE OF PEN USED:

Straight pen and nib

Fountain pen

Ball point pen ✓

HANDEDNESS:

Right-handed ✓

Left-handed

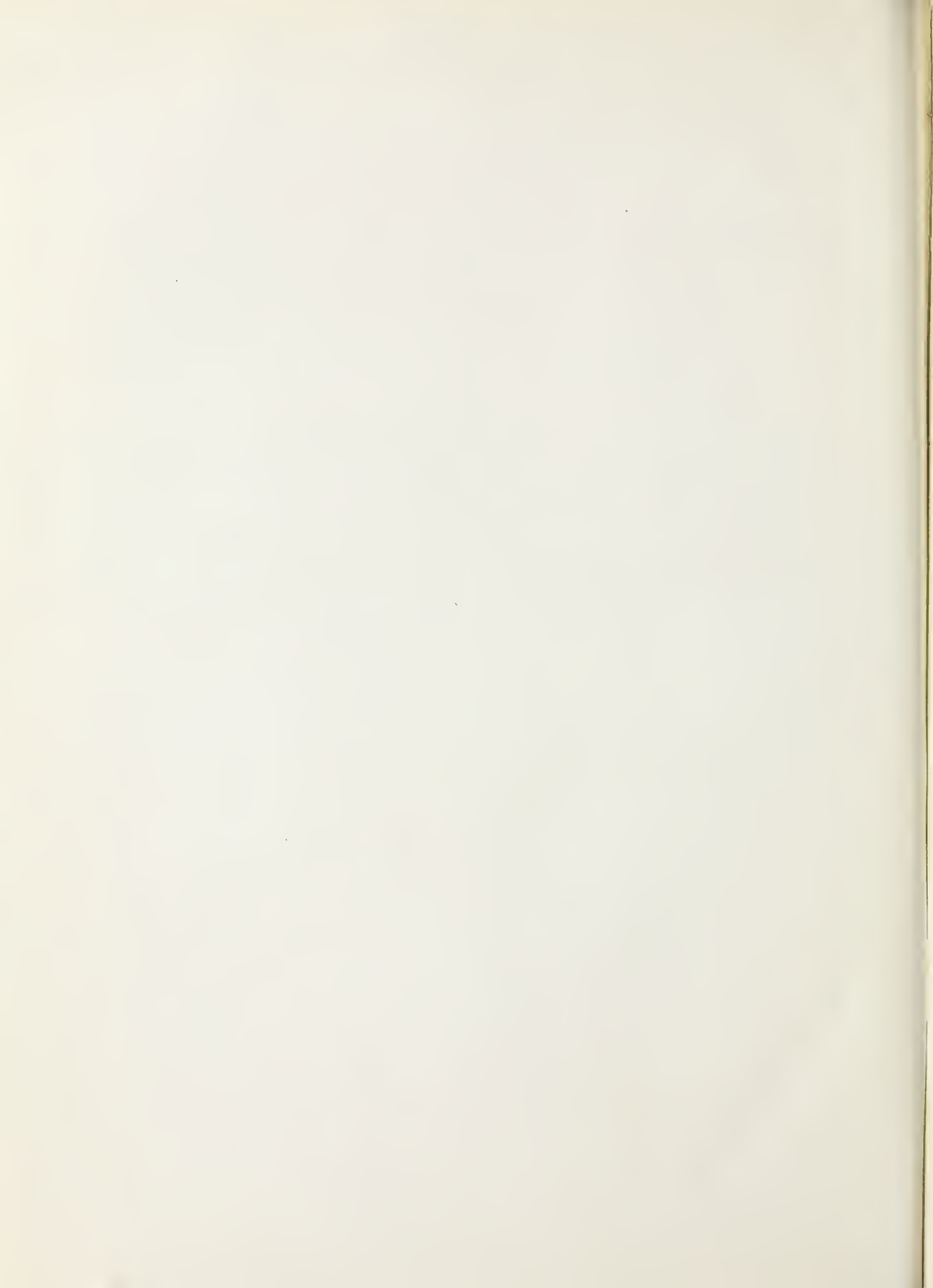
I.Q. 101

"The light from the parlor and kitchen shone out
 I thought the ~~dis~~ windows and bars;
 And light overhead all morning about
 There were thousands and millions of stars
 There no one were such"

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